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THESIS

STUDY OF U.S. MILITARY OFFICERS COMMISSIONED THROUGH ROTC AND THE SERVICE ACADEMIES

by

Ping-Hsiung Lo

March, 1997

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This thesis compares the performance of officers who have been commissioned through the U.S. Reserve Officers Training Corps (ROTC) with that of their counterparts who are graduates of the Service Academies. The study is intended to assist the Republic of China Department of Defense in designing its ROTC program and in establishing measures of program effectiveness. A special data base, developed by the Defense Manpower Data Center, was used as the basis for statistical analysis. The data base includes all U.S. officers who were commissioned in 1977, and allows for the tracking of officers longitudinally through promotion to 0-5. The comparison of performance focuses on promotion rates to 0-4 and 0-5 and the retention experiences of officers in all armed forces, using logistic regression analysis. The results indicate that the U.S. ROTC program is successful in attracting high-quality officers to a career in military service. The success rates of ROTC officers are especially evident in ROTC scholarship programs and in programs administered by the U.S. Air Force. The effects of various demographic variables are also estimated. Further research of U.S. ROTC programs is recommended to aid the government of Taiwan in establishing a similar system for commissioning military officers.

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STUDY OF U.S. MILITARY OFFICERS COMMISSIONED THROUGH ROTC AND THE SERVICE ACADEMIES

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ABSTRACT

This thesis compares the performance of officers who have been commissioned through the U.S. Reserve Officers Training Corps (ROTC) with that of their counterparts who are graduates of the Service Academies. The study is intended to assist the Republic of China Department of Defense in designing its ROTC program and in establishing measures of program effectiveness. A special data base, developed by the Defense Manpower Data Center, was used as the basis for statistical analysis. The data base includes all U.S. officers who were commissioned in 1977, and allows for the tracking of officers longitudinally through promotion to 0-5. The comparison of performance focuses on promotion rates to 0-4 and 0-5 and the retention experiences of officers in all armed forces, using logistic regression analysis. The results indicate that the U.S. ROTC program is successful in attracting high-quality officers to a career in military service. The success rates of ROTC officers are especially evident in ROTC scholarship programs and in programs administered by the U.S. Air Force. The effects of various demographic variables are also estimated. Further research of U.S. ROTC programs is recommended to aid the government of Taiwan in establishing a similar system for commissioning military officers.

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I. INTRODUCTION

A. BACKGROUND

In 1996, the Taiwan Department of Defense (DoD) established a program similar to the U.S. Reserve Officer Training Corps (ROTC) program [Ref. 1, p. 255]. Over the past several decades, combat readiness has become a first priority for Taiwan's DoD. The Taiwan DoD cannot accommodate the demand for junior officers in the armed forces. Recently, the shortage of junior officers has become a serious problem in the armed forces, and it has resulted in training and management being less efficient. The Taiwan DoD has experienced this shortage throughout all branches of the armed forces.

An understanding of the conscription system in Taiwan is required to fully understand why the military is short of officers. Military recruitment in Taiwan is based on two methods, a draft and voluntary service. All enlisted men and some reserve officers (35 percent) enter the military through the draft. They are required to serve for two years in the armed forces. In addition to the draft, about 45 percent of the reserve officers are graduates of specialized military schools, and they are obligated serve for four and a half years.

Volunteer officers make up approximately 15 percent of the total graduates. They are from all of Service Academies and are obligated to serve from six to ten years. These terms depend on the services and communities of services. [Ref. 2, p.124]

Accordingly, the officers corps is composed of only 15 percent volunteers. This is why there is a long-term shortage of military officers in the Republic of China (ROC). To solve the shortage of officers, it is believed that efforts should be made to motivate college students to join the armed forces. The Taiwan DoD invited Professor Ding Kun-jian of the National Chiao-tung University to study the feasibility of developing a new recruiting system ("ROTC" program). The program was approved and put in place in December 1996. Since the Taiwan DoD was implementing an ROTC program for the first time, all preparations, implementations, and disciplines are not yet mature. Taiwan's DoD has high

expectations for the program, but it will encounter many challenges and frustrations in its administration. Therefore, it is felt that the ROC DoD can use the experiences of the U.S. ROTC program as a reference and guide. A study of the U.S. ROTC program, combined with Taiwan's current experience, should help to reduce any problems in implementing the program as well as related risks for the ROC DoD.

B. OBJECTIVE AND RESEARCH QUESTIONS

1. The Objective

The primary objective of this study is to compare the performance of officers commissioned through the United States Service Academies with that of officers commissioned through ROTC. The officers are compared on the basis of promotion rates, retention rates, and quality. This analysis will be used by the Taiwan DoD.

2. Research Questions

The following research questions are addressed after a brief introduction to the U.S. ROTC program.

- Is the new ROTC program in Taiwan likely to solve the shortage of officers, enhance officer performance, and raise officer quality?
- What "reasons," if any, can be drawn from U.S. experience with respect to ROTC?
- How do the promotion opportunities of U.S. ROTC graduates compare with those of Service Academy graduates?
- How do the retention rates of U.S. ROTC graduates compare with those of Service Academy graduates?
- How does the "quality" of U.S. ROTC graduates compare with that of Service Academy graduates?

C. SCOPE, LIMITATIONS, AND HYPOTHESIS

1. Scope

The study is divided into two main parts. The first part addresses how the U.S. ROTC program can be successfully implemented in the ROC. The Taiwan DoD can use information about the U.S. ROTC program results and other U.S. experience to improve its program. The second part of the study compares ROTC graduates and Service Academy graduates with respect to promotion, retention, and quality. The multivariate logit analysis may identify differences in promotion and retention between U.S. ROTC and academy graduates that may also be relevant to Taiwan.

2. Limitations

The data set used in this thesis is from the Defense Manpower Data Center (DMDC). The data set is limited in several ways. For example, the data do not allow analysis of the relationship between officer quality and performance. In addition, there is no information in the data set regarding the college majors of officers in commissioning programs. This sort of research must be accomplished through a survey of the literature. This survey would allow an interpretation of the variables in the database related to the student's motivation, economic factors, and other important variables which led the student to enroll in the ROTC program. This would be a major undertaking, and is beyond the scope of this study.

D. ORGANIZATION OF THE STUDY

Chapter II addresses the U.S. Service Academies and the U.S. ROTC program, in general, and includes a review of literature on the selection of officers. Chapter III describes the DMDC data set and discusses the methodology and the variables in the models. Chapter IV discusses the results of the research, based on cross-tabulations and regression analysis. Finally, Chapter V presents the study conclusions and recommendations.

II. LITERATURE REVIEW

To join the U.S. military as an officer, applicants must generally have a four-year college degree. Certain scientific and technical fields, such as law or medicine, require advanced degrees. The four major pathways to a commission in the U.S. military are:

- Service Academies
- Officer Candidate School (OCS) and Officer Training School (OTS)
- Direct Appointment
- Reserve Officer Training Corps (ROTC)

The following discussion of the academy and ROTC programs draws very extensively from basic reference materials which are indicated in the different sections.

A. U.S. SERVICE ACADEMY PROGRAMS

1. U.S. Military Academy Programs [Ref. 3]

The United States Military Academy (USMA) offers one of the most highly respected, quality, educational programs in the nation. A West Point cadetship includes a fully-funded four-year college education. Each year, the United States Military Academy admits 1,150 to 1,200 young men and women. These new members of the cadet corps come from all corners of the United States and represent nearly every race, religion, and culture in the country. Nurtured by the West Point environment, this diversity of background helps cadets gain a rich cultural, as well as educational, experience. Admission to West Point is based on academic performance, demonstrated leadership potential, physical aptitude, and medical qualification. The requirements for admission are summarized below:

a. General Requirements

Each candidate must:

- Be 17 but not yet 23 years of age by July 1 of year admitted.
- Be a U.S. citizen at time of enrollment (except for foreign students who can be nominated by agreement between U.S. and another country).
- Be unmarried.
- Not be pregnant or have a legal obligation to support a child or children.

b. Academic Qualifications

Each candidate should have:

- An above-average high school or college academic record.
- Strong performance on the standardized American College Testing (ACT) Assessment Program exam or the College Board Admissions Testing Program Scholastic Assessment Test (SAT).

c. Medical and Physical Qualification

Candidates must:

- Be in good physical and mental health.
- Pass a Medical exam.
- Be above-average strength, endurance and agility.
- Display adequate performance on the USMA Physical Aptitude Exam.

2. U.S. Naval Academy Programs [Ref. 4]

a. Basic Eligibility for the United States Naval Academy

Candidates are appointed to the Naval Academy without regard to race, creed, or national origin. To be eligible, candidates must be citizens of the United States. They must also be of good moral character, at least 17 years old but not older than 22, unmarried, and not have dependents.

b. Qualifying Academically

High school studies should prepare candidates for a rigorous college program. The great majority of candidates admitted to the academy come from the top 20 percent of their high school class. College student candidates must enter the academy as a plebe (freshman). Applicants must furnish transcripts of any previous college work. Either the American College Testing program (ACT) or the College Entrance Examination Board (CEEB) Scholastic Assessment Test (SAT-I) is required of all candidates. There are no set minimums for ACT and SAT-I scores. However, to be competitive with other quality candidates who apply, the Academy recommends ACT scores of at least a 22 English and a 26 in Math or SAT-I scores of 530 Verbal and 600 Math.

c. Qualifying Physically and Medically

The Physical Aptitude Examination is used to evaluate coordination, strength, speed, agility and endurance in predicting candidates' aptitude for the physical education program at the Naval Academy. One other important requirement is on the day of admission: overweight candidates may be denied entry even though they have previously passed their medical examinations.

Candidates must pass a medical examination to ensure there is no identifiable condition that might limit success in the academy's rigorous program or preclude unrestricted service as a Navy or Marine Corps officer after graduation. Candidates are notified by the Department of Defense Medical Examination Review Board when and where to take their medical examination.

d. Being Selected for an Appointment to the United States Naval Academy and the Service Obligation

Qualified principal nominees and qualified children of Medal of Honor winners do not have to compete for appointments. All other qualified nominees compete for appointments within individual nominating categories. The best-qualified of these nominees are selected for the appointments available within each competitive category.

Naval Academy graduates receive bachelor of science degrees and commissions as U.S. Navy Ensigns or U.S. Marine Corps Second Lieutenants. They are obligated to serve at least five years in their chosen field.

3. U.S. Air Force Academy Programs [Ref. 5]

The United States Air Force Academy offers a four-year program of instruction and experience designed to provide cadets with the knowledge and character essential for leadership and the motivation to serve as Air Force Career officers. Each cadet graduates with a bachelor of science degree and a commission as a Second Lieutenant in the Air Force. The Air Force Academy is one of the most selective colleges in the country. It takes a well-rounded program of academic, physical, and leadership preparation to meet the Academy challenge. In addition, cadets are exposed to a balanced curriculum that provides a general and professional foundation essential to a career Air Force officer.

a. Eligibility

To qualify for appointment consideration, the candidate must :

- Be between 17 and 22 years of age.
- Be a U.S. citizen (international students authorized admission are exempt from the U.S. citizenship requirement).
- Be of high moral character.
- Meet high leadership, academic, physical, and medical standards.
- Be unmarried, with no dependents.

b. Selection composite

Academic performance constitutes the major portion of the evaluation. An academic composite is needed that includes grades in high school and any college courses, rank in class, and college admission test scores. The historical mean scores for those entering the Air Force Academy are SAT verbal of 626 and SAT Math of 649. The

Academy's Admissions Panel includes faculty and staff review, a candidate's fitness test, an admissions liaison officer interview, and a writing sample. In addition, candidates are evaluated with respect to their athletic participation, leadership positions (scouts, school clubs, class officer, or other public/community involvement), and work experiences. [Ref. 9]

c. Service Obligations

Graduates of the Air Force Academy are required to and serve as a commissioned officer in the Air Force for at least five years after graduation. After five years, the officers become eligible to request a separation from the Air Force.

B. U.S. ROTC PROGRAMS

ROTC programs are provided at colleges and universities throughout the United States. As of 1996, the Army ROTC program was offered at more than 310 host colleges and universities, with at least 100 additional extension centers and about 900 more colleges participating under cross-enrollment agreements (for students not attending an ROTC host institution). Navy-Marine Corps ROTC programs were located at 66 host colleges and universities, along with another 130 or more colleges with cross-enrollment agreements. ROTC host colleges for the Air Force numbered around 150 in 1996, with an additional 700 or so colleges participating under a cross-enrollment agreement. It is estimated that about 100,000 students were currently enrolled in an ROTC program as of 1996.

Undergraduate students in public or private institutions may receive training to become military officers under ROTC programs for the Army, Air Force, Navy, and Marine Corps. As noted above, there are approximately 500 ROTC units at colleges and universities nationwide. ROTC training consists of several hours of military instruction per week and at least one summer camp. Advanced ROTC training is given during the junior and senior years in college.

Students must meet qualification requirements and be selected for admission to the advanced course. Depending on the service and ROTC option selected, students train for

two or four years. Many receive scholarships for tuition, books, fees, etc., as well as a monthly allowance. Graduating ROTC cadets become commissioned military officers and either go on active duty or become Reserve or National Guard members. Each year, about 45 percent of U.S. military officers are obtained through an ROTC program. The various ROTC programs and scholarships offered are discussed in detail in each service section that follows.

1. U.S. Army ROTC College Programs

a. The Four-Year Program

The Four-Year Army ROTC Program is divided into two parts, called the Basic Course and the Advanced Course. The military science training given each year is designated as follows:

- Freshmen (1st year): Military Science I (MSI)
- Sophomore (2nd year): Military Science II (MSII)
- Junior (3rd year): Military Science III (MSIII)
- Senior (4th year): Military Science IV (MSIV)

The Basic Course imposes no military obligation on the part of the students, and they may withdraw at any time before the end of the second year. All necessary ROTC textbooks, uniforms, and other essential materials for the Basic Course are furnished to the students at no cost. After they have completed the Basic course, students who have demonstrated the potential to become an officer and who have met the physical and scholastic standards are eligible to enroll in the course.

The Advanced Course is usually taken during the final two years of college. It includes instruction in organization and management, tactics, ethics and professionalism, and further leadership development. All necessary textbooks and uniforms in the Advanced Course are also furnished to students at no cost. During the summer between their junior

and senior years of college, Advanced Course cadets attend a fully-paid six-week training session called Advanced Camp. Advanced Camp gives cadets a chance to practice what they have learned in the classroom, and introduces them to Army life in the field. [Ref. 6, p. 8]

b. The Two-Year Program

The Two-Year Program offers students the opportunity to enhance their education and graduate with more than a college degree. Valuable leadership and management training is offered both in and outside the classroom. Students develop new skills and gain the practical experience needed as an Army officer, as well as in civilian careers.

The Two-Year Program is designed for junior and community college graduates, students at four-year colleges who did not take ROTC during their first two years at school, students entering a two-year post-graduate course of study, and students attending military junior colleges.[Ref. 6, p. 9]

The first step in the Two-Year Program is Basic Camp, a fully-paid six-week training camp is normally held during the summer between the sophomore and junior years. At Basic Camp, students learn to challenge themselves physically and mentally, and to build their confidence and self-respect. They learn to descend from various heights by rappelling from a 50-foot tower, perform under pressure by guiding others to safety in a test of leadership, stay afloat while swimming with full gear, and navigate in the wilderness using only a map and compass. Once Basic Camp is successfully completed, students are eligible to enter the Advanced Course. During the next two years in college, they receive advanced instruction in leadership development, organization and management, tactics, and ethics and professionalism.

Advanced Course cadets learn valuable business and administrative skills, such as how to lead people and how to manage money and equipment. They develop a sense of responsibility and self-discipline. These are important qualities sought by the military and by civilian employers. During the summer between their first and second years

of the Advanced Course, student cadets attend a fully-paid Advanced Camp. There, they have the opportunity to put into practice what they have learned in the classroom.

c. How to Enroll in Army ROTC

Students interested in joining Army ROTC should select a college or university that offers the program and visit the Professor of Military Science during the registration period. The ROTC program can then be integrated with the standard registration procedures. Students interested in the Two-Year program should contact the Professor of Military Science early in their sophomore year. The Professor of Military Science (PMS) will arrange for orientation on the Army ROTC Two-Year program and for a required medical examination, and determine their eligibility for Basic Camp the following summer. Students who successfully complete Basic Camp and meet all other requirements are enrolled in the ROTC Advanced Course at the beginning of the next school year. [Ref. 6, p 10]

d. Scholarship Program

The Army employs a "whole person score" (WPS) in selecting candidates for its Four-Year scholarship program. The WPS is composed of the following weighted factors: Scholastic Assessment Test (SAT) or American College Test (ACT) score (25 percent); high school class standing (25 percent); participation in extracurricular activities and other elements that show leadership ability (40 percent); and the Physical Aptitude Examination (PAE, 10 percent).

The Army WPS has a score range of 1 through 999, and cutoff scores can change from one year to the next, depending on the number and quality of applicants. Nevertheless, the Four-Year scholarship program does establish specific cutoff scores for the SAT and ACT, and, if these minimums are not met, the candidate is rejected without further review. During the 1995-1996 school year, applicants were required to achieve a minimum SAT score of 850 (combined Verbal and Math) or an ACT composite score of 17. [Ref. 7, p. 117]

e. Non-scholarship Program

Currently, the Army non-scholarship program uses the Precommissioning Assessment System (PAS) for selecting candidates. Precommissioning selection normally occurs at the beginning of the junior year in college. Applicants are evaluated on the basis of physical fitness, grades, participation in extracurricular activities, writing skills, and motivation (as interpreted through a structured interview). Applicants must also achieve a passing score on the Officer Selection Battery (OSB) Forms 3 and 4.[1] A score of 90 or above on the OSB is generally required (the OSB scale has a mean of 100 and a standard deviation of 20). Candidates scoring below 90 may be accepted, and guidelines are provided on how to treat such cases. For example, persons scoring from 81 through 89 may be subjected to a "whole person evaluation," which may find outstanding performance in another area (such as grade point average) and be seen to compensate for the lower OSB score. [Ref. 7, p.118]

2. U.S. Navy-Marine Corps ROTC College Programs

a. The Four-Year Program

Applicants for the Four-Year, non-scholarship NROTC program are selected by the Professor of Naval Science of each NROTC unit from among students already admitted or selected for admission by the NROTC college or university. First-year college program students receive all required uniforms and naval science textbooks. There is no military obligation on the part of enrollees during the first two years in the Basic Course. College program students may gain scholarship status later on by competing for one of the Chief of Naval Education and training scholarships, normally offered semiannually by obtaining a Professor of Naval Science nomination.

If accepted for enrollment in the Advanced Course, college program students must enlist in the Naval Reserve or the Marine Corps Reserve. As of 1996 they

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[1] The Officer Selection Battery is currently used by the armed service to select officer candidates. It includes initiative decision making, administration, communication, and so on. The OSB 3 and 4 were developed by the U.S. Army Research Institute for the Behavioral and Social Sciences.

received a monthly subsistence allowance of $150 for a maximum of 20 academic months. [Ref. 7, p.34]

Students in the Advanced Course are required to successfully complete naval science courses, a few specific university courses, and attend one summer training session, normally at sea (or at Quantico, Virginia for Marine-option midshipmen).

No active-duty obligation is incurred until students begin the Advanced Course, which usually starts in the junior year. The active duty obligation then becomes three years with a longer obligation incurred for pursuit of some specialties. After graduation from college and completion of the NROTC requirements, students are commissioned Ensigns in the Naval Reserve of Second Lieutenants in the Marine Corps Reserve. The NROTC four-year scholarships are awarded annually. They are based on a national competitive selection process in which consideration is given to such factors as high school class standing, college board scores, extracurricular activities, and leadership qualities. NROTC scholarship selectees are appointed midshipmen, United States Naval Reserve, and are granted compensation and benefits authorized by law for a period not to exceed four years of undergraduate study. [Ref. 6, p.34]

b. The Two-Year Program

Students selected for the Two-Year, non-scholarship NROTC program are those with advanced college standing who qualify for enrollment in the Advanced Course. They must make application for enrollment through the Professor of Naval Science at the NROTC college or university before the spring of their sophomore year. When accepted, they attend, and must successfully complete, the six-week course at the Naval Science Institute in Newport, Rhode Island.

Upon returning to college in the fall, they are enrolled in its NROTC program and begin receiving free naval science textbooks, uniforms, and a $150 a month subsistence allowance for a maximum of 20 academic months through the end of their senior year. Those enrolled in the Two-Year non-scholarship program have the same privileges, responsibilities, and obligations as those in the Four-Year non-scholarship

program. Two-Year college program graduates are commissioned in the Naval Reserve or Marine Corps Reserve and serve three years on active duty. [Ref. 6, p. 35]

c. Scholarship program

The Navy Four-Year scholarship program uses a two-step process in selecting students: initial screening followed by final selection. SAT or ACT scores serve as the sole criterion for initial screening. Those who qualify are then reviewed by a selection board. During the 1995-1996 school year, initial selection required a score of at least 950 on the SAT (450 verbal and 500 Math). Applicants who achieve the minimum required test score are then evaluated on the basis of several weighted factors: SAT or ACT scores (19 percent); high school rank (56 percent); results of a structured interview by a Navy officer (10 percent); results of the Strong Campbell Interest Inventory, used to predict career tenure (9 percent); and scores derived from a biographical questionnaire designed to predict retention (5 percent). [Ref. 7, p. 117]

d. Non-scholarship Programs

The non-scholarship portion of the Navy ROTC program is called the college program. College program students are selected by individual units, and standards vary by unit. There are no centrally established admission criteria. Selection for scholarship programs of less than four years also takes place within the various units, with no uniform criteria. [Ref. 7, p. 119]

3. U.S. Air Force ROTC College Programs

a. The Four-Year Program

The Four-Year Air Force ROTC Program is divided into two parts called the General Military Course (GMC) and the Professional Officer Course (POC). The General Military Course, a two-year course normally taken during the freshman and sophomore years, covers two main themes--the development of air power and the contemporary Air Force in the context of U.S. military organizations. The Air Force training given in each of the two years is designated as follows:

- Freshman or 1st Year--Aerospace Studies (AS) 100
- Sophomore or 2nd Year--Aerospace Studies (AS) 200

Course classes normally meet once a week for one hour. In addition, cadets must attend the Leadership Laboratory. The Professional Officer Course, a two-year course normally taken during the students' junior and senior years, covers Air Force leadership and management, and American defense policy. The Air Force training given in each of the two years is designated as follows:

- Junior or 3rd Year--Aerospace Studies (AS) 300
- Senior or 4th year--Aerospace Studies (AS) 400

The first two years of the Air Force ROTC Four-Year program, the general military course, require one hour of classroom work and one to two hours of leadership laboratory each week. Cadets who wish to compete for entry into the last two years of the program--the professional officer course--must do so under the requirements of the Professional Officer Course Selection System, a national competitive selection system. This system uses qualitative and quantitative factors such as grade-point average, unit commander evaluation and aptitude test scores. After selection, students must complete a four-week, summer field training encampment at an assigned Air Force base.

Once enrolled in the professional officer course, cadets are enlisted in the Air Force Reserve and assigned to the obligated reserve section. This entitles them to a monthly, non-taxable $150 allowance during the academic year. [Ref. 10]

b. The Two-Year Program

The Two-Year Program consists of the Professional Officer Course (POC)--the last two years of the Four-Year Program. It is designed to provide greater flexibility to meet the needs of students desiring Air Force opportunities. The basic requirement is that applicants have two academic years remaining at either the undergraduate or graduate level, or a combination of both.

Applicants for the Two-Year Program must successfully complete a paid six-week Field Training Course at an Air Force base during the summer preceding the fall term in which they intend to enter the program. [Ref. 10]

c. Enrollment Criteria

The first two years of the Air Force ROTC college program, the General Military Course, is open to all students at least 14 years old. Second-year scholarship cadets and all cadets entering the last two years of the college program must be at least 17. These contract cadets must meet Air Force ROTC and Department of Defense eligibility standards ranging from physical fitness to U.S. citizenship. Unless a waiver is granted, individuals must be commissioned prior to age 30. [Ref. 10]

d. Scholarships

As of 1996, emphasis in the Air Force ROTC college scholarship program is to award scholarships to candidates pursuing undergraduate engineering or other scientific and technical disciplines. Nearly 90 percent of Air Force ROTC scholarships are awarded in these disciplines; however, students in every degree program enjoy scholarship opportunities.

Scholarships are awarded in increments of four, three, two, and one years. Of the 4,500 active scholarships during academic year 1994-1995, approximately 800 went to incoming freshmen.

Air Force ROTC offers three types of scholarships. Type I covers full tuition and most required fees. Type II covers tuition and fees up to $9,000 annually an award that covers the cost at most U.S. colleges and universities and are usually awarded via the College Scholarship Program (CSP). The third type is targeted scholarships of the CSP which are awards designated specifically for lower cost, normally in-state tuition-level institutions. In addition, Air Force ROTC has an incentive scholarship program for cadets contracted into the professional officer course who are not already receiving such benefits. This incentive scholarship paid up to $2,000 annually as of 1996. [Ref. 10]

All types of awards provide funds for books, most required fees and a $150 monthly, non-taxable allowance. Plus, all scholarship cadets are required to meet certain academic, military and physical fitness standards to earn and maintain scholarship benefits. All non-prior service scholarship recipients must be younger than 25 as of June 30 of the calendar year during when commissioning is scheduled. Prior service applicants may have the age limit extended by the total days of active-duty military service, up to a maximum of four years. [Ref. 10]

The Air Force follows the same basic procedures in selecting candidates for its various odd-year scholarship programs as it does for its Four-Year program. However, since the applicant has been in college for at least one year, college Grade Point Average (GPA) is substituted for high school average and no minimum scores are set for the SAT or ACT. Furthermore, the applicant is required to achieve a minimum score on the Air Force Officer Qualifying Test (AFOQT). [Ref. 7, p. 119]

e. The Non-scholarship Program

The Air Force uses the AFOQT in screening applicants for its non-scholarship programs. Minimum required scores are 15 on the verbal composite and 10 on the quantitative composite. (Percentile scores are used. The normative population has a relatively high ability level considered necessary for officer applicants.) Pilot candidates are required to have scores of 25 on the pilot composite and 10 on the Navigator-Technical composite, and navigator candidates are required to have scores of 10 on the pilot composite and 25 on the Navigator-Technical composite. The scores for pilots and navigators on these two composites must also add up to a total of at least 50.

Applicants to non-scholarship programs in the Air Force are then given a Quality Index score.[2] The Quality Index score is made up of both academic and nonacademic factors that are weighted about equally. Nonacademic factors include the

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[2] The Quality Index Score is used for admission into the last two years of AFROTC.

detachment commander overall rating; review board ratings of self-confidence, human relations, extracurricular participation, and communication skills, and a physical fitness test.

The academic component includes cumulative grade point average and the scores on two AFOQT composites (Verbal and Quantitative).[3] An applicant must also be in "good standing with the academic requirements of his or her college or possess a cumulative grade point average of 2.0 (on a 4.0 scale) if the college does not have a good standing rule." [Ref. 7, p. 119]

C. SELECTION CRITERIA STUDIES

Eitelberg et al., in "Becoming Brass," provide a brief comparison and concise summary of officer quality measures in the ROTC programs and the academies. [Ref. 7]

1. The Selection of Officers

Each year, thousands of commissioned officers are selected in a variety of ways and may have prepared for their new positions through any one of many different programs. Each of the armed services operates independently and in a variety of ways. A brief overview of the relationship between aptitude test scores and officer performance was gleaned from the services' own validation studies and testing research, as well as from the results of original analyses using the Scholastic Assessment Test (SAT).

Several aptitude tests are currently used by the armed services to select officer candidates. The academies, like most undergraduate colleges, use the SAT or the ACT in conjunction with high school class rank. ROTC programs primarily use SAT and ACT scores to determine eligibility, but some programs require additional tests.

Table 1 presents a summary of the aptitude tests and academic achievement measures used to select officer candidates for each of the services' programs.

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[3] AFOQT: Air Force Officer Qualifying Test. It consists of sixteen subtests and grouped to five composites: Pilot, Navigator-Technical, Academic Aptitude, Verbal and Quantitative.

Table 1. Aptitude Tests and Academic Criteria Used to Screen Officer Candidates by Program and Service, 1987-1988 [Ref. 7, p. 111]

Program	Army	Navy	Marine Corps	Air Force
Academy	SAT/ACT H.S. Rank	SAT/ACT H.S. Rank	*	SAT/ACT H.S. Rank
ROTC Scholarship	SAT/ACT H.S. Rank College GPA	SAT/ACT H.S. Rank H.S. GPA	*	SAT/ACT H.S. Rank H.S. GPA College GPA AFOQT
ROTC Non-scholarship	OSB 3 &4	Varies by Unit	*	AFOQT SAT/ACT College GPA

Abbreviations:

SAT	Scholastic Aptitude Test	OSB	Officer Selection Battery
ACT	American College Test	OCS	Officer Candidate School
H.S.	High School	ROTC	Reserve Officer Training Corps
GPA	Grade Point Average	ASVAB	Armed Services Vocational Aptitude
AFOQT	Air Force Officer Qualifying Test Battery		

*Same as Navy. Up to 16 percent of Naval Academy Graduates may be commissioned as Marine Corps officers; and the same portion of Naval ROTC students are permitted to enter the Marine Corps each year.

2. How the Aptitude Tests are Used in Selecting Officer Candidates

The aptitude tests both across and within the armed services are used for the study of ROTC and Academy graduates. Their analysis focuses on SAT and ACT scores employed by the separate services. What is the relationship between aptitude test scores and officer performance? Recent research on the relationship between aptitude test scores and officer performance can be categorized according to the criteria used in developing the tests and setting minimum standards. Generally, five different types of criteria are employed by the military testing psychologists: (1) college grade point average; (2) training course grade; (3) school or training attrition; (4) military performance rating; and (5) job performance. These criteria are often applied in various combinations, depending on the purpose of the test. [Ref. 7, p. 110]

Research by Eitelberg and his colleagues shows that the aptitude measures currently being used by the armed services to select officer candidates are related in varying degrees to officer performance. The strongest relationships are found for students who have experienced college or military attrition, military performance ratings, and other areas of performance for new officers. It should be emphasized that aptitude tests are not the sole criteria for admission to military officer programs. Indeed, all pre-commissioning programs use aptitude tests in conjunction with other information on the applicant to make selection decisions. The connecting thread throughout all of these programs is a common reliance on the "whole person" approach to screening applicants. [Ref. 7]

A preliminary effort was made to examine the relationship between SAT scores and officer performance, with the help of an SAT/officer data base. Three traditional measures of military performance--promotion, retention, and attrition--formed the focus of the analysis. [Ref. 7, p. 110]

3. Promotion

Military officers are subject to an "up or out" policy of promotion. This policy states that individuals who are passed over for promotion twice are released from service. The purpose of "up or out" is to provide, at each rank, more qualified officers than there are positions at the next higher rank, creating, in essence, a promotion system that supposedly lets only the very best rise to the top. At the same time, officers who are fully qualified for promotion may find themselves "out" rather than "up" for any of various reasons relating more to promotion policies or their particular career path than to job performance. In this sense, at least, promotions may not actually reflect true differences in performance.

The promotion criterion is also complicated by the fact that promotion periods vary between services and between occupational groups within the separate service. Nonetheless, within all services, the SAT mean scores of officers promoted to either 0-2 or 0-3 are higher than those of officers who were not promoted. These differences are statistically significant in all comparisons except at the level of 0-3 in the Marine Corps.

This conclusion is supported by the fact that the SAT mean scores of officers, when compared by promoted or not-promoted categories, are higher at the 0-3 level than at the 0-2 level within all four services. [Ref. 7, p. 126]

4. Retention

Manpower analysts use retention as a "performance" measure because it shows the longer-term return to the military of its investment in the recruiting and training of personnel. In addition. retention serves to show how well the individual has fit into the military environment, assuming that people stay in service because (a) they are perceived to be good performers by their employer (and are thus encouraged to continue) and (b) they themselves prefer to extend their employment.

Retention rates may also vary by occupation for several reasons, including participation in advanced training, programmed turnover, job market factors, quality of life, and job satisfaction, as well as the special bonuses or economic incentives used to retain officers in critical fields. For the present study, a simple comparison was made using the average number of months served by officers and a two-way split of SAT average scores: officers scoring above the fiftieth percentile on the SAT (combined Verbal and Math) and those scoring below. But there is very little difference between the number of months served by officers in each of the two SAT categories. The combined experiences of the services give a small edge to officers in the upper fiftieth percentile, who served an average of 97.1 months, compared with 94.1 months for those in the lower fiftieth percentile. [Ref. 7, 128]

D. RELATED RESEARCH

Related research has evaluated the relationship between commissioning sources and officer performance, promotion, and retention in the armed forces. In 1990, the Congressional Budget Office (CBO) completed a survey about the cost differentials from different commissioning sources and differences in officer performance [Ref. 11]. The study measured officer performance in three categories: time on active duty after

commissioning; promotion time; and rate of involuntary separation from active duty service. The CBO survey found that the Service Academies were the most expensive source of commissioning. For example, the Naval Academy cost $153,000 per graduate. This cost was three-times to four-times higher than NROTC, and 8-to 15-times higher than OCS. At the same time, Academy graduates tend to have higher retention rates than do officers from other commissioning sources. No difference was found between commissioning sources with respect to an officer's promotion to 0-3. However, CBO did find that officers commissioned through OCS had slower times of promotion to 0-4 than did officers from other commissioning programs.

III. DATA AND METHODOLOGY

A. THE DATA

1. The Population Review

The data file used for this analysis was provided by the Defense Manpower Data Center (DMDC) in Monterey California. The data file is drawn mainly from the Officer Master File, 1977 Cohort, which contains longitudinal information on officers who began commissioned service in 1977.

The file contains a snapshot of the 1977 Cohort on an annual basis from the time of commissioning through 1994. The cohort originally had 25,335 observations and 1,064 variables. The variables are named as they appear in the Officer Master File, but with a two-digit ending number that represents the year for which the variable contains data. (For example, in the case of race, variables are shown as RACE77, RACE78, RACE79, …, RACE94.) Prior to the data analysis, some effort was required to examine the contents of the files and establish the types of data the file contains. Variables were verified against the DMDC code book to determine if the information entered into the files was still valid and useful. In some cases, the data code had changed between two consecutive years, and the code book did not always give the file user clear information. Another critical element of this study was to determine which variables would be useful in building a logistic model to predict retention and promotion relationships.

A theoretical model would identify the variables or determinants that affect the retention and promotion of officers in pay grade O-4. This study uses ten individual models to run the RETENTION and PROMOTION models. It includes four promotion models by services and one promotion model with occupations; four retention models by service and one retention model with occupations. The underlying premise is that retention and promotion factors are influenced by certain personal characteristics such as race, gender,

marital status, military service-related variables, occupation fields, educational level, and source of commission.

Since both promotion and retention have similar determinants, this study uses the same explanatory variables for the two models.

2. Restrictions

In determining the logistic regression model, the possibility of error in the data files is noted. Since the study is directed at retention and Academy versus ROTC graduates in the pay grade O-4, it is important to examine the initial pay grades of all individuals in the cohort at the service entry point.

The following restrictions were imposed on the original data sets to answer the research question, using the most representative observations:

1. All warrant officers, pre-enlisted officers, and limited duty officers were excluded from the data, to ensure that all officers were newly commissioned.

2. All officers were removed who were not a Second Lieutenant or an Ensign when first commissioned in the 1977 Cohort. Since a comparison of ROTC and Academy graduates is the primary objectives of the analysis, all other grades were removed.

3. The commissioned officers at time of entry must be 21 years of age or older, thus eliminating some officers who may still be in colleges at the time of their commission.

4. All officers must have a college degree, ensuring they are qualified for the officer program. Officers who did not have a degree at the time of commissioning were removed from the data set.

5. The data include only officers who were commissioned in FY 1977.

B. COMPUTED MEANS AND STATISTICS

1. Commission Age Distribution

After the initial commission officer qualification screening for the study, the 1977 Cohort observations declined from 25,355 to 12,714, and the explanatory variables fell

from 1,064 to 18. The results were used for the selected observations and explanatory variables to run the regression model. Table 2 gives a brief summary of the commission age distribution for the 1977 Cohort.

Table 2. Age at Time of Commission, by Service, Fiscal 1977 Cohort

Age at Time of Commission (Years)	ARMY	NAVY	MARINE CORPS	AIR FORCE	All SERVICES
21-25	4521	2926	580	3963	11990
%	92	96.6	92.7	95.5	94
26-30	375	101	46	179	701
%	7.6	3.3	7.3	4.3	5.5
Great than 30	16	1	0	6	23
%	0.3	0.03	0	0.14	0.18
Total	4912	3028	626	4148	12714

As seen in Table 2, 94 percent officers in the 1977 Cohort were commissioned at the age of 21-25. Table 2 also shows that Army officers tended to be older at the time of commissioning: The Army had the lowest proportion of officers in the 21-25 year range (92 percent), and the highest proportion in 26-30 year range (7.6 percent). Only 0.18 percent of the officers in all services had a commissioning age higher than 30.

2. Frequency for the Explanatory Variables

Table 3 presents the frequencies of the explanatory variables from the 1977 Cohort. The average entry age for the cohort is 22.6 years. Some variables can only be viewed by percentage, since the results are meaningless for the mean values. As observed from the data, the 1977 Cohort in different selected years, the separation rate tends to differ between ROTC and Academy graduates. There are several insights that can be gained from the frequency table. These include:

1. For the 1977 Cohort at the entry year -- Academy graduates constitute 19.4 percent and ROTC 56.9 percent of the total entrants. This is higher than their annual average admission percentage (ROTC 45 percent, and Academy 15 percent). OTHER has 23.7 percent of the 1977 Cohort entrants.

2. For the 1977 Cohort at the commission year -- only 3.7 percent of officers have a Master's degree. In 1988, this rate increased to 67.5 percent. This indicates

Table 3. Frequency for the Explanatory Variables, as of 1977, 1988, and 1994

Year	1977		1988		1994	
All Obs	12714		5581		4008	
VARIABLES	Obs	%	Obs	%	Obs	%
WHITE	11446	90.0	5053	90.5	3644	90.9
MINORITY	1251	10.0	526	9.4	350	8.7
MALE	11356	89.3	5140	92.0	3682	91.8
FEMALE	1358	10.7	441	7.9	319	7.9
ACADEMY	2467	19.4	1266	22.7	934	23.3
ROTC	7236	56.9	3187	57.1	2341	58.4
OTHER	3011	23.7	1128	20.2	733	18.2
MARRIED	4028	31.7	4857	87.0	3632	90.6
CHILDREN	3654	28.7	4712	84.4	3633	90.6
POSTGRAD	474	3.7	3772	67.5	2998	74.8
TACTICAL	2421	19.0	3053	54.7	2081	51.9
INTEL	73	0.6	280	5.9	228	5.6
SCIPROF	1021	8.1	712	12.8	463	11.5
ENGMAINT	122	1.0	182	3.3	148	3.6
HEALTH	65	0.5	301	5.4	210	5.2
ADMIN	994	7.8	500	8.9	366	9.1
SUPPLY	405	3.2	516	9.2	348	8.7
NONOCC	170	1.3	29	0.5	2	0.05
ARMY	4912	38.6	1903	34	1550	38.7
NAVY	3028	23.8	1121	20	749	18.7
MARINE	626	4.9	259	4.6	162	4
AIRFORCE	4148	32.6	2298	41.1	1546	38.6

Note: Obs: Observations in the service.
The definition of the variables see Appendix Table 33.

that post-graduate education is becoming an important factor for officers at the grade of 0-4.

3. In 1977, 31.7 percent of officers were married and 28.7 percent had children or more than two dependents. In 1988, 87 percent of officers were married and 84.4 percent had children.

4. As of 1977 the TACTICAL occupation had the largest proportion of officers at 19 percent. In 1988, it increased to 54.7 percent. This suggests that TACTICAL has more vacancies and opportunities for promotion than do other occupations.

5. In 1977, 90 percent of officers were WHITE. This proportion has remained stable through 1994.

There are some restrictions when interpreting the results:

1. Since a number of officers are not able to obtain an occupational qualification in their first year of service, the "UNKNOWN" variable for this field included 5,079 officers.

2. The "GENERAL" and "NONOCCUPATIONAL" occupational categories were eliminated from analysis as explanatory variable.

C. THE METHODOLOGY

Research and analysis were accomplished through the Naval Postgraduate School's mainframe computer, running the Statistical Analysis System (SAS). Data file support was provided by DMDC. The study focused on the promotion and retention rates of officers commissioned through an Academy or the ROTC program in 1977. Cross-tabulation analyses used to interpret the outputs for each commissioning source and to examine the variables of the models. The RETENTION and PROMOTION models both used the same explanatory variables for the individual services, to best compare their promotion and retention behavior. Different years were used as selection points in the service models, because each service exercises a different policy in promoting and retaining officers (promotion -- Army and Marine Corps use the year 1989, Navy and Air Force use the year 1988; retention -- Army and Marine Corps use 1988, Navy and Air Force use 1987). The reason for the differences is that the individual services have different polices with respect to promotion.

1. Theoretical Models

The theoretical model identified variables and determinants that affect the retention and promotion of officers in pay grade O-4. As previously noted ten models, for RETENTION and PROMOTION, were constructed. The underlying premise of these models was that retention and promotion factors are influenced by certain personal characteristics (listed above). Since promotion and retention have similar determinants, the same variables were used for both models.

2. Model Specification and Hypothesized Relationships

As previously noted, there were certain limitations in the types of variables available for use in the model specification. STAY is the dependent variable in the RETENTION model. This binary variable has a value of "1" for an officer who remained in the military and a value of "0" for an officer who was separated prior to relevant promotion years discussed above.

a. The Retention Model

The regression model for the individual services defines STAY as a function of the following variables:

STAY = f(FEMALE, MINORITY, MARRIED, ROTC, OTHER, POSTGRAD, CHILDREN)

The expected signs of the logistic coefficients are included in Table 31 of the Appendix.

The combined services' regression model defines STAY as a function of the following variables. The occupation variables are defined in Appendix, Table 33.

STAY = f(FEMALE, MINORITY, MARRIED, ROTC, OTHER, POSTGRAD, CHILDREN, INTEL, TECHNIC, HEALTH, OTHSUP, SUPPLY)

The expected signs for the retention models are shown in the Appendix Table 31. Variables with a positive sign indicate that it is hypothesized that individuals with that characteristic are more likely to stay in the service; a negative sign indicates that the officer is more likely to leave the service. Because the dependent variable is a 0-1 categorical variable, binomial logistic models are used to analyze the retention rates. Figure 1 shows the relationship between the explanatory variables and retention.

b. The Promotion Model

In the PROMOTION model, the variable PROMOTION was selected as the dependent variable. The variable coded as "1" for promoted and "0" for not promoted. The selected comparison year for the Army and Marine Corps is 1989; the comparison year for

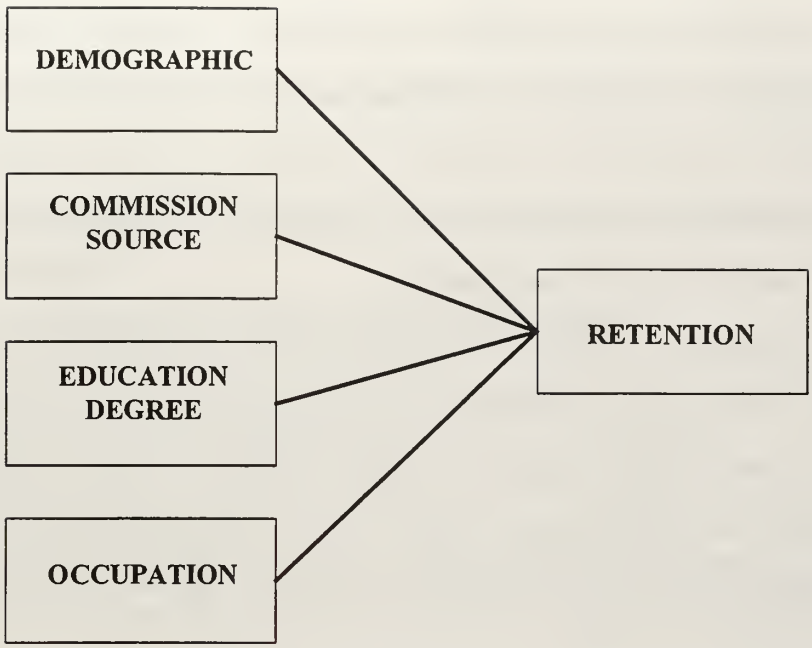

Figure 1. The Explanatory Variables for Retention Model

the Navy and Air Force, 1988 is used. The observations were selected from officers who met the O-4 promotion board. Those who left the military prior to meeting the board was not included in the model. Figure 2 shows the retention promotion model only for officers who remained in the military.

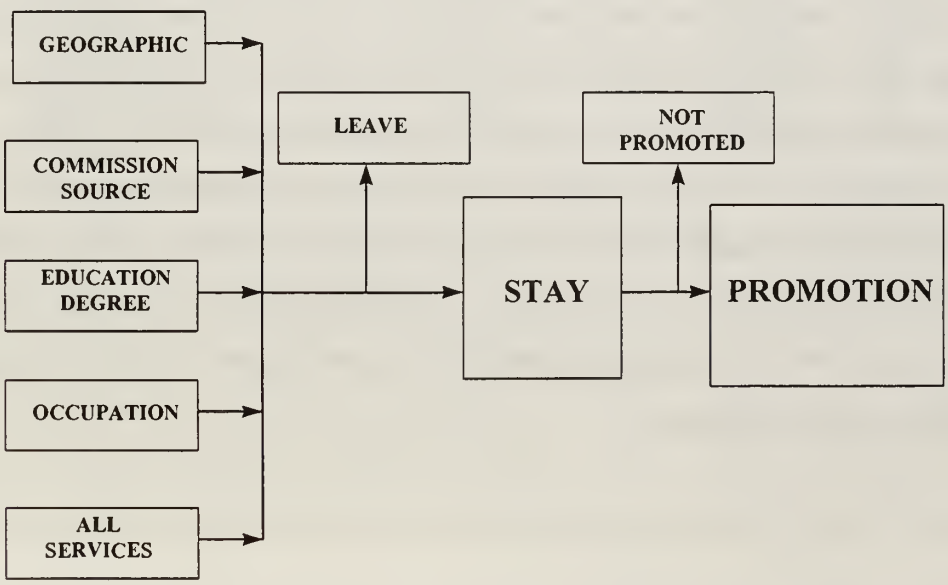

Figure 2. Explanatory Variables for Promotion Model, Only for Officers who Stayed

The promotion logistic model for the individual services is as follows:

PROMOTION = f(FEMALE, MINORITY, MARRIED, ROTC, OTHER, POSTGRAD, CHILDREN)

The retention and promotion logistic models for the combined services that includes occupations contains the following variables:

PROMOTION = f(FEMALE, MINORITY, MARRIED, ROTC, OTHER, POSTGRAD, CHILDREN, INTEL, ENGMAINT, SCIPROF, HEALTH, ADMIN, SUPPLY, NONOCC)

The limited Officer Master File (OMF) was used to select explanatory variables. Each variable was given the code 1 and 0. Figure 1 gives the selection steps for promotion. The expected signs for the PROMOTION model are shown in the Appendix, Table 32.

D. DEFINITION OF THE VARIABLES

The variables used in the models are discrete and can only take on a value of "0" or "1." Table 33 in the Appendix presents a list and description of the explanatory variables used in the analysis of the RETENTION and the PROMOTION models.

In certain instances, some variables are left out of the logistic equation. These include those that act as the Base Case variables for the model, or are not present in individual services because the relevant service does not have the specific occupation. For example, the reference case for the logistic regression in the RETENTION model is a WHITE, male officer, not married, without children, with no postgraduate degree, serving in a tactical occupation, and a Academy graduate. In the RETENTION model, the variable TECHNIC includes two occupations, ENGMAINT and SCIPROF; OTHSUP combines ADMIN and NONOCC in this model.

E. RESULTS FOR MULTIVARIATE MODELS

The results of the binomial regression models are presented below. The models tended to support the initial hypotheses contained in the Appendix. Ten models were developed and applied to the 1977 Cohort. Tables 4 through 13 provides a condensed view of the major findings.

1. Results of 1977 Cohort RETENTION Model

The results from the Army logistic retention models are displayed in Table 4. All of the variables had the hypothesized sign. (See Table 31 of Appendix)

The Army ROTC graduates' retention rate is less than that of officers from the Service Academies prior to the O-4 grade; and the MINORITY retention rate is less than that of WHITE. Officers with a Master's degree have a higher retention rate than those who do not.

Table 4. Logistic Results of Army Retention Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	0.0092	0.9469
MINORITY	-0.0426	0.7073
MARRIED	1.0798	0.0001*
ROTC	-0.0360	0.7474
OTHER	-0.2405	0.1184
POSTGRAD	5.3685	0.0001*
CHILDREN	0.7638	0.0001*

N=4619.

(*) Denotes variables that were significant at the 0.05 confidence level.

Navy ROTC graduates have a lower retention rate than officers from the Naval Academy in the O-4 grade. The MINORITY retention rate is less than that of WHITE. Officers with a Master's degree have a higher retention rate prior to O-4 grade.

In the Marine Corps, the ROTC graduates have a higher retention rate than Service Academy graduates. FEMALE and MINORITY have a lower retention rate than the Base Case. Officers with a Master's degree have higher retention rate than those who do not.

Table 5. Logistic Results of Navy Retention Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	0.3472	0.1518
MINORITY	-0.2036	0.3363
MARRIED	-0.3873	0.0007*
ROTC	-0.3752	0.0013*
OTHER	-0.2479	0.0272*
POSTGRAD	5.1561	0.0001*
CHILDREN	0.9255	0.0001*

N=2675.
(*) Denotes variables that were significant at the 0.05 confidence level.

Table 6. Logistic Results of Marine Corps Retention Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	-0.0316	0.9584
MINORITY	-0.3338	0.5485
MARRIED	0.5306	0.0688**
ROTC	0.2333	0.5645
OTHER	-0.1984	0.6071
POSTGRAD	4.6692	0.0001*
CHILDREN	1.4916	0.0001*

N=531.
(*) Denotes variables that were significant at the 0.05 confidence level.
(**) were significant at 0.1 confidence level.

In the Air Force, ROTC graduates have a lower retention rate than graduates of the Air Force Academy prior to the O-4 grade. Officers with a Master's degree have a higher retention rate than do those without a graduate degree. FEMALE and MINORITY officers have a lower retention rate than the base case.

In Table 8, the retention results include all services and several occupations, using 1988 as the comparison year. The table gives a brief regression result of the 1977 Cohort. Through the table, the logistic regression can confirm the relationship between officer retention and the explanatory variables.

Table 7. Logistic Results of Air Force Retention Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	-0.2319	0.2449
MINORITY	-0.6319	0.0054*
MARRIED	0.6827	0.0001*
ROTC	-0.1182	0.3933
OTHER	-0.0858	0.7065
POSTGRAD	5.8762	0.0001*
CHILDREN	1.1660	0.0001*

N=3441.
(*) Denotes variables that were significant at the 0.05 confidence level.

As seen in Table 8, FEMALE and MINORITY officers have lower retention rate than do WHITE, MALE officers. ROTC graduates have a lower retention rate than graduates of Service Academies. All of the occupations explicitly included in the model have a higher retention rate than the TACTICAL occupation. Officers with a Master's degree have a higher retention rate than those who do not have a graduate degree.

Table 8. Logistic Results of Retention Model With Occupations

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	-0.9175	0.0001*
MINORITY	-0.5583	0.0001*
MARRIED	0.8950	0.0001*
ROTC	2.2277	0.0001*
OTHER	2.4679	0.0001*
POSTGRAD	4.5464	0.0001*
CHILDREN	0.0988	0.1434
INTEL	3.8095	0.0001*
TECHNIC	3.1961	0.0001*
HEALTH	1.7377	0.0001*
OTHSUP	3.4931	0.0001*
SUPPLY	5.4979	0.0001*

N=11266.
(*) Denotes variables that were significant at the 0.05 confidence level.

2. Results of 1977 Cohort PROMOTION Model

The results of 1977 Cohort PROMOTION model were obtained by the same regression analysis method employed in the RETENTION model. Only officers who are still in the service in 1988 are included in the estimation.

Army ROTC graduates have a lower promotion rate than do graduates of the Military Academy. FEMALE and MINORITY officers both have higher promotion rates than the WHITE, MALE officers. Officers with a Master's degree have a higher promotion rate than those who do not have an advanced degree.

Table 9. Logistic Results of Army Promotion Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	0.5179	0.1892
MINORITY	0.3393	0.3596
MARRIED	3.1865	0.0001*
ROTC	-0.1919	0.5373
OTHER	0.2183	0.6281
POSTGRAD	1.8720	0.0001*
CHILDREN	0.5115	0.1469

N=1699.
(*) Denotes variables that were significant at the 0.05 confidence level.

In the Navy, the ROTC graduates have a lower promotion rate than do officers from the Naval Academy. Officers with a Master's degree have a higher promotion rate than do those who do not have a graduate degree.

In the Marine Corps, ROTC graduates have a lower promotion rate than do graduates of a Service Academy. All MINORITY officers were promoted in the O-4 grade. However, only five of the 167 officers who met the promotion board were MINORITY. Officers with a Master's degree show higher promotion rate than those who do not have an advanced degree.

Table 10. Logistic Results of Navy Promotion Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	0.0930	0.8546
MINORITY	-0.0171	0.9752
MARRIED	5.1109	0.0001*
ROTC	-0.6214	0.0682**
OTHER	-1.3059	0.0001*
POSTGRAD	4.7343	0.0001*
CHILDREN	0.3128	0.7198

N=949.
(*) Denotes variables that were significant at the 0.05 confidence level.
(**) were significant at 0.10 confidence level.

Table 11. Logistic Results of Marine Corps Promotion Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	-1.3143	0.2109
MINORITY	35.6653	0
MARRIED	1.2553	0.1180
ROTC	-0.6785	0.5457
OTHER	-0.6483	0.5543
POSTGRAD	1.1475	0.1791
CHILDREN	-0.7244	0.3504

N=167.

In the Air Force, both the FEMALE and MINORITY officers have a lower promotion rate than the WHITE, MALE officers. ROTC graduates promotion rate is lower than graduates of the Air Force Academy. Officers with Master's Degree have a higher promotion rate than those who do not have a graduate degree.

Table 13 shows the FEMALE and MINORITY promotion rate, and confirms the above results. The POSTGRAD variable indicates that officers with a Master's Degree are more likely to be promoted to 0-4 than those who do not have graduate education (base case).

Table 12. Logistic Results of Air Force Promotion Model

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	-0.5343	0.2380
MINORITY	-0.4555	0.3540
MARRIED	1.8272	0.0001*
ROTC	-0.1273	0.7554
OTHER	-0.0270	0.9657
POSTGRAD	1.9575	0.0001*
CHILDREN	0.2328	0.5637

N=1564.

(*) Denotes variables that were significant at the 0.05 confidence level.

The logistic regression in the promotion model that includes occupations (Table 13) also shows that the ROTC graduates promotion rate is less than the Service Academy graduates. The FEMALE promotion rate is higher than that of MALE officers, but the value is not significant. The MINORITY promotion rate is lower than that of WHITE officers. Officers with a Master's degree have a higher promotion rate than those who do not have a graduate degree.

Table 13. Logistic Results of Promotion Model With Occupations

INDEPENDENT VARIABLE	COEFFICIENT	Pr>Chi-square
FEMALE	0.1790	0.1818
MINORITY	-0.3906	0.0008*
MARRIED	0.7537	0.0001*
ROTC	-0.2982	0.0003*
OTHER	-0.3576	0.0008*
POSTGRAD	0.9233	0.0001*
CHILDREN	0.0461	0.5812
INTEL	0.0206	0.8916
ENGMAINT	0.6350	0.0001*
SCIPROF	1.6589	0.0001*
HEALTH	0.0427	0.7818
ADMIN	-0.0966	0.4396
SUPPLY	0.1879	0.1164
NONOCC	1.4652	0.0209**

N=4379

(*) Denotes variables that were significant at the 0.05 confidence level.

(**) were significant at 0.10 confidence level.

IV. SUMMARY STATISTICS

A. CROSS TABULATION ANALYSIS

Cross-tabulation analysis is an excellent evaluation tool to explore relationships between selected variables. This study uses several cross-tabulations to study factors related to officer performance. A brief discussion of the relevant findings is presented following each tabulation.

1. Cross-Tabulation by GENDER and SOC

Table 14 is derived from the 1977 Cohort by GENDER and SOURCE of COMMISSION (SOC) in 1977, 1988, and 1994. The tabulation shows the relationship between these two variables.

Table 14. Cross-Tabulation, by GENDER and SOURCE OF COMMISSION (SOC) 1977 Cohort in 1977, 1988, and 1994

SOC	ROTC			ACADEMY			OTHER			TOTAL		
Gender\Year	77	88	94	77	88	94	77	88	94	77	88	94
MALE	6662	2975	2192	2467	1266	934	2227	899	564	11356	5140	3690
%	92	93	94	100	100	100	74	80	77	89	92	92
FEMALE	574	212	149	0	0	0	784	229	169	1358	441	318
%	8	7	6	0	0	0	26	20	23	11	8	8
BOTH	7236	3187	2341	2467	1266	934	3011	1128	733	12714	5581	4008

The number of officers by commissioning source and gender is shown in Table 14. The data track the differences of retention and promotion behavior between gender and SOC. The following results are drawn from Table 14.

1. The 1977 Cohort has 89.3 percent male officers and 10.6 percent female officers. In 1988, male officers in the 1977 Cohort increased to 92 percent, but female officers decreased to 7.9 percent. This indicates that, after 11 years service, the male officers have a higher retention rate than the female officers in the military. A result derived from this feature of the table is that the longer the Cohorts are in service, the more stable the retention rate appears.

2. There are no data in the 1977 Cohort for female academy graduates. The first female cadets were admitted to the Service Academies in 1976, and the first women were commissioned in 1980. Consequently, the table cannot show any data for female officers from the Service Academies for the 1977 Cohort.

3. In the 1977 Cohort, female officers were commissioned through the OTHER commissioning source (57.7 percent) and from the ROTC program (42.3 percent).[4] When checking the commission source in detail, it was found that 38.4 percent female officers were commissioned by direct appointment.[5] In 1977, 8 percent of female officers were commissioned through the ROTC program and only 16.6 percent of them were from the scholarship option of the program. This may be because the 1977 ROTC scholarship program was very popular, selective, and placed more restrictions on female applicants.

2. Cross-Tabulation by SVC and SOC

The tabulations in Tables 15 and 16 were derived from the SERVICE and SOC variables. This tabulation provides a profile of which the services that have more ROTC officers. Since the Academy graduates' annual commissioning qualities are the same and graduates are committed to the same basic service commitment for five years, the only difference between the tables are the percentages.

Table 15. Cross-Tabulation, by SERVICE and SOURCE OF COMMISSION (SOC), 1977 Cohort in 1977, 1988, and 1994

SOC	ROTC			ACADEMY			OTHER			TOTAL		
Service\Year	77	88	94	77	88	94	77	88	94	77	88	94
Army	3311	1264	1026	718	362	300	883	277	224	4912	1903	1550
%	45.8	39.6	43.8	29.1	28.6	32.1	29.3	24.5	30.5		N/A	
Navy	956	322	218	838	368	278	1234	431	253	3028	1121	749
%	13.2	10.1	9.3	34.0	29.1	29.8	41.0	38.2	34.5		N/A	
Marine Corps	185	39	25	61	29	15	380	191	122	626	259	162
%	2.5	1.2	1.1	2.5	2.3	1.6	12.6	16.9	16.6		N/A	
Air Force	2784	1562	1072	850	507	341	514	229	133	4148	2298	1546
%	38.5	49.0	45.8	34.5	40.0	36.5	17.1	20.3	18.1		NA	
All Services	7236	3187	2341	2467	1266	934	3011	1128	733	12714	5581	4008

Note: The percentage was calculated by the service observations / All services observations in each year.

4 The percentage was calculated by the observations value in 1977.

5 The value derived from the cross-tabulation not displayed in the table.

Table 16. Cross-Tabulation, by SERVICE and SOURCE OF COMMISSION (SOC), 1977 Cohort in 1977, 1988, and 1994

SOC	ROTC			ACADEMY			OTHER			TOTAL		
Service\Year	77	88	94	77	88	94	77	88	94	77	88	94
Army	3311	1264	1026	718	362	300	883	277	224	4912	1903	1550
%	67.4	66.4	66.2	14.6	19.0	19.4	18.0	14.6	14.5	N/A		
Navy	956	322	218	838	368	278	1234	431	253	3028	1121	749
%	31.6	28.7	29.1	27.7	32.8	37.1	40.8	38.4	33.8		N/A	
Marine Corps	185	39	25	61	29	15	380	191	122	626	259	162
%	29.6	15	15.4	9.7	11.1	9.3	60.7	73.7	75.3	N/A		
Air Force	2784	1562	1072	850	507	341	514	229	133	4148	2298	1546
%	67.1	68.0	69.3	20.5	22.1	22.1	12.4	10.0	8.6	N/A		
All Service	7236	3187	2341	2467	1266	934	3011	1128	733	12714	5581	4008

Note: the percentage was calculated by the service observations / Total observations in each year.

The results of Tables 15 and 16 can be summarized as follows:

1. The total ROTC distribution in 1977 was 45.8 percent Army, 13.2 percent Navy, 2.5 percent Marine Corps, and 38.5 percent of the Air Force.

2. The Academy distribution in 1977 was 29.1 percent of the Army, 34 percent of the Navy, 2.5 percent of the Marine Corps, and 34.5 percent of the Air Force.

3. ARMY ROTC: The Army ROTC program is an important officer commissioning source. In 1977, 67.4 percent of the Army officers were commissioned through the ROTC program. In the same year, the Academy only produced 14.6 percent of the officers, much lower than the percentage of ROTC graduates and less than their annual average percentage. Compared with other services, the Army has the highest percentage of ROTC officers. This may be because the Army believes ROTC officers are higher quality and better performers or it may be due mainly to cost factors.

4. NAVY ROTC: The Navy and Marine Corps have the lowest percentage of ROTC commissioned officers of all the services. In 1977, 31.6 percent of Navy and 29.6 percent of Marine Corps officers were commissioned through the ROTC programs. One reason maybe that the Navy needs high quality officers and is more selective. The Marine Corps has its own commission training course for officers: the OCS, OTS, and Platoon Leader Course (PLC).

5. AIR FORCE ROTC: The Air Force also has an ROTC program. In the 1977 Cohort, about 67.1 percent its officers were commissioned through the ROTC program. In the longitudinal data, the percentage is increasing. In 1988, this cohort had a 68 percent retention rate. This is reason the Air Force hosts a large number of college and university ROTC programs across the country.

B. RETENTION AND PROMOTION OVERVIEW

1. Retention

a. Military Commission Obligation

To understand the 1977 Cohort retention behavior and analyze retention trends, it is necessary to first check the basic commitment for each commission source. This study focuses on the ROTC scholarship, ROTC nonscholarship, and Academy graduates. Table 17 gives the basic obligation for the ROTC and Academy graduates.

Table 17. Military Commission Obligation for ROTC and Academies

SOC	ACADEMY	ROTC Scholarship	ROTC Nonscholarship
ARMY	5 years	8 years 2 to 4 years on active duty followed by 8 years service as a citizen soldier in the Army National Guard (ARNG) or U.S. Army Reserve	8 years Either 3 years on active duty and 5 years in the Reserve Forces or if selected to serve on Reserve Force Duty (RFD), serving 3 to 6 months on active duty attending an Officer Basic Course and the remaining 8 years in the Reserve Forces
NAVY	5 years	8 years 2 and 4 years scholarship require 4 years in active duty	8 years 2 and 4 years nonscholarship required 3 years in active duty
MARINE CORPS	5 years	The same as Navy	The same as Navy
AIR FORCE	5 years	8 years The Air Force commitment diverse by occupations Non flying officers 4 years active duty Pilot officers 8 years active duty Navigator officers 6 years active duty Nursing officers 4 years active duty	The same as scholarship

Source: Military Academy admission introduction. [Ref. 4, 5, 6]

Each of the commissioning groups in the table has their own service obligation, depending on the program choice. Although some of the officers are given early separation, most of them complete their obligation and decide to stay or leave the service.

This study uses the basic service commitment to compare SOC and SVC and to interpret retention behavior. The basic commitments are as follows:

1. Academy: All Academy graduates have at least a 5-year commitment.
2. ROTC: The ROTC commitment differs by service. The Army and Navy have an eight-year obligation. The Air Force obligation depends on the specialty. This study uses the 8th year to compare the basic commitment retention rate.

b. ROTC First Commitment Retention Rate

Table 18 provides a profile of the SOC retention rate for all services in 1985. First, examine the ROTC graduates' retention rate. In 1985, after the officers completed their first term, the Air Force scholarship graduates had the highest retention rate of 69.8 percent. The Air Force nonscholarship graduates had a retention rate of 69 percent. Marine Corps' data were difficult to interpret, and no explanation is provided.

Table 18. ROTC First Commitment Retention Rate, by SOURCE OF COMMISSION (SOC) and SERVICE, 1977 Cohort in 1985

SOC	ROTC		ACADEMY	OTHER	TOTAL
	Scholarship	Nonscholarship			
ARMY					
1977	1360	1951	718	883	4912
1985	595	1121	446	389	2551
%	43.8	57.4	62.1	44.1	51.9
NAVY					
1977	845	111	838	1234	3028
1985	412	49	501	581	1543
%	48.8	44.1	59.7	47	50.9
MARINE CORPS					
1977	5	180	61	380	626
1985	41	2	36	227	306
%	NA	NA	59.0	59.7	48.9
AIR FORCE					
1977	1389	1395	850	514	4148
1985	969	963	632	277	2841
%	69.8	69.0	74.3	53.8	67.9
TOTAL					
1977	3599	3637	2467	3011	12714
1985	2017	2135	1615	1474	7241
%	56.0	58.7	65.4	48.9	57.0

Omitting the comparison with the Marine Corps, the lowest retention rate is found for the Army ROTC scholarship, 43.8 percent. Army nonscholarship graduates have a 57.4 percent retention rate, higher than the scholarship graduates. The ROTC nonscholarship graduates have a 58.7 percent retention rate, and scholarship graduates have an average 56 percent retention rate. The Air Force has the top retention rate of 67.9 percent. The Navy retention rate is only 50.9 percent, but this percentage is close to the Army ROTC officers' retention rate of 51.9 percent. Although the tabulation is focused on the ROTC first-term retention rate, it can be used to compare other commissioning sources' retention during the same time period.

c. Academy First Commitment Retention Rate

Table 19 gives a profile of academy first-term retention rates, individual service retention rates, and a comparison of the rate with the ROTC graduates' first-term retention behavior. All Academies have the same commitment of five years, so the selected year is 1982.

Table 19. Academy First Commitment Retention Rate, by SOURCE OF COMMISSION (SOC) and SERVICE, 1977 Cohort in 1982

SOC	ACADEMY	ROTC	OTHER	TOTAL
ARMY				
1977	718	3311	883	4912
1982	601	1844	684	3129
%	83.7	55.7	77.4	63.7
NAVY				
1977	899	1141	1614	3654
1982	772	813	1073	2658
%	85.8	71.2	66.5	72.7
AIR FORCE				
1977	850	2784	514	4148
1982	795	2297	322	3414
%	93.5	82.5	62.6	82.3
TOTAL				
1977	2467	7236	3011	12714
1982	2168	4954	2079	9201
%	87.8	68.5	69.0	72.3

Note: The commission source of the Marine Corps officers in this table were included in the Navy, since all graduates were from Naval Academy.

Using Table 19, the study examines the Academy graduates first-term retention rate to analyze the retention behavior among the Academies and compare it with that of other commission sources. In 1982, the Air Force Academy had the highest retention rate among the academies at 93.5 percent. This is likely to have resulted, in part, from the longer commitment required of pilots. The Naval Academy had a retention rate of 85.8 percent. The Army Military Academy graduates had the lowest retention rate of 83.7 percent, but this rate is still higher than any other commissioning source. This result supports the hypothesis for the RETENTION model. In 1982, the average retention rate for all SOC and SVC was 72.3 percent.[6] Comparing the first-term retention behavior of ROTC and Academy graduates, the ROTC graduates have a 57.4 percent retention rate (combined scholarship and nonscholarship), and Academy graduates have an 87.8 percent retention rate. This result verifies the model hypothesis as well as supports the theory that the Academy graduates have a higher incentive to stay in the military.

d. Retention Distribution in 1988 by Occupation

To confirm the hypothesis about DPOC prediction, this study examines data in 1978 and 1988. See Table 33 in the Appendix for a discussion of the occupations.

Table 20 presents a summary of SOC and SVC and DPOC. This tabulation gives an assessment of officers distributed in all services. Since occupational areas of officers are different from service to service, the occupations have been defined in ten general categories. In 1977, 5,079 officers did not have a DPOC. This is because some occupations require longer training for qualification. In 1978, the unknown observations decreased to 3,665. So the occupation categories give general information. From Table 20, in 1978, TACTICAL is the largest group in all services. ROTC has 33.6 percent [7] (2,359/7,020) of its graduates in this occupation. The Academies have 37 percent (909/ 2,454) of its graduates in TACTICAL. In 1988 the ROTC graduates increased to 52.7

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6 The retention rate was calculated by (1982 / 1977) officer observations.

7 The percentage was calculated from 1978 ROTC (Tactical / All) observations. All observations value can be found in Table 20.

percent (1,680/3,187), and the Academy graduates increased to 73.4 percent (929/1,266) in TACTICAL. This result suggests that this occupation offered more jobs and vacancies for officers in future promotion and retention. This is why the study selected the TACTICAL occupation as the model base case.

Table 20. Cross-Tabulation for Retention, by SOURCE OF COMMISSION (SOC), SERVICE, and DEFENSE PRIMARY OCCUPATION (DPOC), 1977 Cohort in 1978

DPOC \ SOC		ARMY		NAVY		MARINE CORPS		AIR FORCE		TOTAL	
	YEAR	ROTC	ACAD	ROTC	ACAD	ROTC	ACAD	ROTC	ACAD	ROTC	ACAD
TACTICAL	1978	856	336	148	122	68	24	1278	427	2359	909
	1988	666	286	220	281	30	22	764	340	1680	929
INTEL	1978	154	6	11	11	2	0	136	5	303	22
	1988	97	7	7	7	1	1	78	7	183	22
ENGMAINT	1978	381	77	174	112	9	1	474	87	1038	277
	1988	107	27	35	31	2	2	2478	79	391	139
SCIPROF	1978	5	0	10	0	0	0	77	11	92	11
	1988	9	13	3	7	0	2	80	28	92	50
HEALTH	1978	15	0	0	0	0	0	4	0	19	0
	1988	97	11	4	16	0	0	18	26	119	53
ADMIN	1978	388	8	69	17	10	4	542	38	1009	67
	1988	160	7	13	3	2	1	199	12	274	23
SUPPLY	1978	116	2	47	6	13	1	189	0	365	9
	1988	124	9	32	10	4	1	176	12	336	32
NONOCC	1978	0	6	0	0	77	31	19	275	96	312
	1988	0	0	8	13	0	0	0	2	8	15

Note: 1. The observations exclude the unknown and missing values.
2. ACAD as Academy.
3. The table exclude the General and Unknown variables, because General variable is a linear independent variable, Unknown variable cannot verify their occupation.

In INTEL, the ROTC and Academies both have a small percentage. In 1978, the Academies have only 22 individuals in the INTEL occupation. Ten years later, in 1988, they still have 22 officers in this occupation. It may be that this occupation requires more training and has more restrictions; hence, for these officers, it may be difficult to transfer to other specialties.

The ENGMAINT is the second-largest community. There is a large decrease between the two comparison years of 1978 and 1988. Of these officers, only 40.3 percent (530/1,315) stayed. Others were apparently separated or transferred to different occupations.

In SCIPROF, in 1988, the ROTC had the same number of observations as in 1978, but the Academies increased from 11 to 50. This could be due to officer transfers to that specialty. In HEALTH, in 1978, there are only 19 observations (all in ROTC). But in 1988, the observations increased to 172. It may be because this occupation requires longer training and a certificate exam. ADMIN is the third largest community in the occupation. In 1978, the ROTC and Academies have 1,076 observations; but, by 1988, only 27.6 percent (297/1,076) of these officers stayed in the military. In SUPPLY, there is a high retention rate. In 1988, 98.3 percent (368/374) of officers stayed, and most of them were from the Air Force. It may be that the Air Force requires more officers to serve in the SUPPLY occupation. The Air Force retention rate is also the highest of all services. NONOCC is those officers who do not have a specialty. The data set places them in this occupation. In 1978, NONOCC had 408 observations; but, in later years, when the officers had obtained an occupation code, the observations decreased. In 1988, only 23 observations were left this occupation. Most of these officers transferred to other occupations, so the number of officers in other occupations increased correspondingly.

e. Retention Rate for the 1977 Cohort

Table 21 uses the SOC to calculate and show the retention rate in each year after the officers were commissioned, by commissioning source.

Figure 1 shows the retention trend. Using the graph to predict the tendency of the retention rate gives the models more creditability. The interesting rates are as follows:

1. Academy: In the first 4 years, the Academies have a 99 percent retention rate; but, in the fifth year in 1982, when the officers complete their first commitment, the rate decreased to 90 percent. After 11 years, in 1988, the retention rate dropped by 9 percentage points. This is when some officers are not promoted to O-4. Those promoted typically remain in service, after the promotion, so the retention rate remains steady. In 1994, after the O-5 grade promotion, the retention rate again decreased to 14 percent. Some officers were separated by the promotion board.

Table 21. Retention Rate Evaluation of 1977 Cohort, by Year, 1977-1994

SOC	ACADEMY		ROTC		OTHER		TOTAL
Year	Obs	%	Obs	%	Obs	%	Obs
1977	2467		7236		3011		12714
1978	2454	99	7202	<100	2904	96	12378
1979	2438	99	6704	93	2824	97	11996
1980	2420	99	6316	94	2491	88	11227
1981	2406	99	5378	85	2205	89	9989
1982	2168	90	4954	92	2079	94	9201
1983	1968	91	4582	92	1906	92	8456
1984	1776	90	4276	93	1766	93	7818
1985	1615	91	4152	97	1474	83	7241
1986	1483	92	3969	96	1381	94	6833
1987	1414	95	3834	97	1297	94	6545
1988	1266	90	3187	83	1128	87	5581
1989	1170	92	3008	94	1099	97	5277
1990	1168	<100	2940	98	997	91	5105
1991	1141	98	2911	99	968	97	5020
1992	1107	97	2830	97	933	96	4870
1993	1089	98	2740	97	894	96	4723
1994	934	86	2341	85	733	82	4008

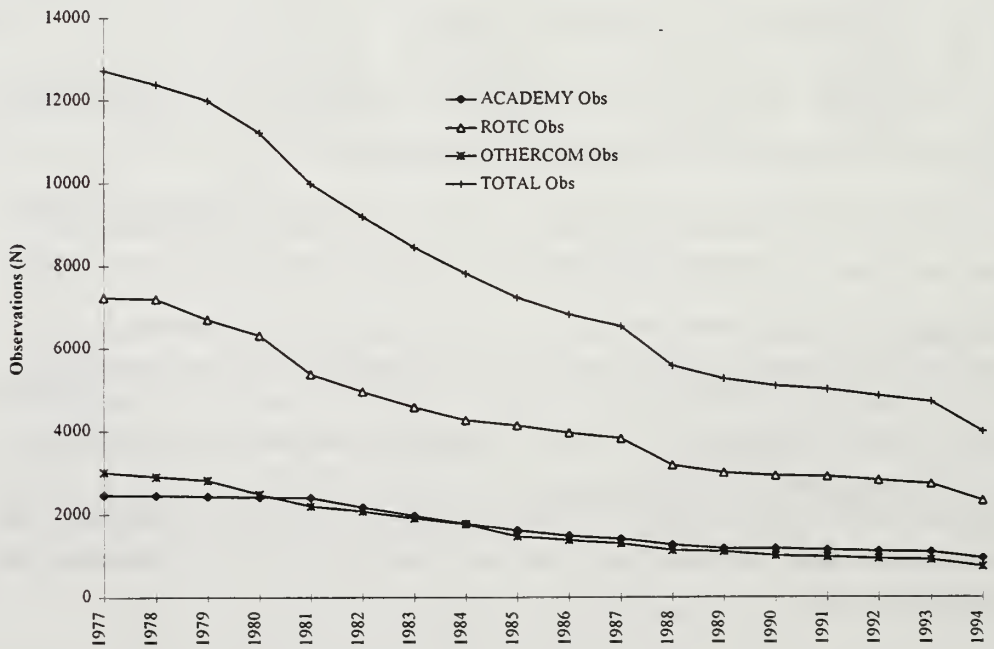

Figure 3. Retention Rate Evaluation of 1977 Cohort, by Year, 1977-1994

2. ROTC: The first big retention rate drop of 15 percent occurred in 1981, after the graduates had four years service on active duty. This is because some of the ROTC graduates selected to separate or transfer to the reserves. In 1988, the retention rate dropped an additional 17 percent. This is likely because of a failure to be selected for O-4 promotion. After 1988, the retention rate is stable. In 1994, the next promotion restriction caused another 15 percent of officers to separate.

3. OTHER: The other commissioning sources have a similar retention rate, but they also have a higher separation rate than the Academies or ROTC. In 1985, after the first commitment, their retention rate had dropped by 17 percent. In 1988, after the O-4 grade promotion board, another 13 percent of the officers separated. In 1994, in pay grade O-5, 18 percent officers were forced out or separated involuntarily. Each year, their retention rate was less than that of the Academy and ROTC graduates.

2. Promotion

a. Promotion to Grade O-4 by SOC

So far, the study has only discussed retention rates. Now it employs cross-tabulation analysis to explore promotion rates by commissioning source. Table 22 presents a promotion rate comparison of the promotion board in the O-4 grade. The table shows the relationship between officers' promotion rates and career opportunities by different commissioning sources. The results from Table 22 are summarized below:

1. Academy: In 1986, the Service Academy graduates only constituted 6.3 percent of the officers that were promoted. Some of these were early promotions. As discussed earlier, the services have different promotion policies. In 1987, the promotion rate increased and was 29.1 percent for the ten-year length of service. This rate is less than for the ROTC scholarship graduate and OTHER graduates, but it is higher than the ROTC nonscholarship graduate. In 1988, the 11th year of service, the Service Academy promotion rate was up to 66.7 percent. This is higher than that of other commissioning sources, but less than the rate of 72.6 percent for ROTC scholarship graduates.

Table 22. Cross-Tabulation of Promotion to Grade O-4, by SOURCE COMMISSION (SOC), for 1977 Cohort as of 1986, 1987, and 1988

YEAR	SOC	ACADEMY	ROTC		OTHER	TOTAL
			Scholarship	Nonscholarship		
1986	All Obs	1483	1337	2632	1381	6833
	Promoted	94	89	14	268	465
	%	6.3	6.7	0.5	19.4	6.8
1987	All Obs	1414	1273	2561	1297	6545
	Promoted	412	393	87	448	1340
	%	29.1	30.9	3.4	34.5	20.5
1988	All Obs	1266	1457	1730	1128	5581
	Promoted	845	1058	847	689	3439
	%	66.7	72.6	49	61	61.6

2. ROTC: In 1986, the early promotion rate for scholarship graduates (6.7 percent) was higher than for Academy graduates, but less than the OTHER graduates' promotion rate of 19.4 percent. The nonscholarship graduates have A rate of just 0.5 percent. One might conclude that the ROTC commissioning source has large differences in officer quality. The scholarship program is more competitive than the nonscholarship program. The higher the selection source standards, the higher the officer quality, performance, and promotion. In 1987, the scholarship graduates promotion rate (30.9 percent) is a little higher than that of Academy graduates (29.1 percent); but the nonscholarship rate is much lower than others (only 3.4 percent).

3. The promotion rate of officers from OTHER sources is 34.5 percent, higher than that of ROTC and the Academy. In 1988, the ROTC scholarship had a 72.6 percent promotion rate, which was higher than the nonscholarship rate of 49 percent. This suggests that the scholarship graduate tends to have a considerably higher promotion rate than that of the nonscholarship graduate. The Service Academies have a higher promotion rate than ROTC and OTHER commission sources in the long term. The ROTC and OTHER graduates have very close promotion rates of 61 percent.

b. Promotion to Grade O-5 by SOC

The PROMOTION model predicts that ROTC and OTHER graduates will have a lower likelihood to promote than Academy graduates. The results from Table 23 confirm that prediction.

Table 23. Cross-Tabulation for Promotion to Grade O-5, by SOURCE OF COMMISSION (SOC), for 1977 Cohort as of 1994

SOC	ACADEMY			ROTC		OTHER	TOTAL
	ARMY	NAVY	AIR FORCE	Scholarship	Nonscholarship		
Obs	299	293	342	760	1581	733	4008
Promoted	241	272	327	626	1186	518	3170
%	80.6	92.8	95.6	82.3	75.0	70.7	79.1
Average %	90.0			77.4		70.7	79.1

Table 23 presents a cross-tabulation showing promotion to grade O-5 by SOC. This is used to better understand the career experiences of the 1977 Cohort and interpret their promotion rates. By 1994, the 1977 Cohort officers had served for 17 years. Most of the officers were promoted to grade O-5. It usually takes 14 to 15 years to be promoted to O-5. In the Army, it takes longer, about 16 years. From Table 23, it can be seen that the Academies have higher promotion rates (90 percent) than do other sources of commission. The Air Force has the highest promotion rate (95.6 percent) among the Academies, and the Army has the lowest promotion rate among the Academies. ROTC scholarship graduates have a higher promotion rate (82.3 percent) than do the ROTC nonscholarship graduates (75 percent).

Surprisingly, the OTHER graduates have the lowest promotion rate (70.7 percent). This result indicates that in the long-term, the Service Academies tend to have consistently higher promotion rates than other SOCs. This result confirmed the study's hypothesis that the Service Academies have higher promotion rates than other SOCs.

c. Promotion to Grades O-4 and O-5 by Gender and SOC

Table 24 shows the GENDER and SVC relationship in the O-4 and O-5 promotion board results. The FEMALE variable has only a small number of observations,

Table 24. Cross-Tabulation for Promotion to Grades O-4 and O-5 by GENDER and SOURCE OF COMMISSION, for 1977 Cohort as of 1988 and 1994

SVC		ARMY	NAVY	MARINE CORPS	AIR FORCE	TOTAL
1988	Male Obs	1730	1075	247	2088	5140
	Promoted	217	1066	10	1895	3188
	%	12.54	99.2	4.0	90.8	62
	Female Obs	173	46	12	210	441
	Promoted	28	43	2	178	251
	%	16.2	93.5	16.7	84.8	57
1994	Male Obs	1407	716	154	1405	3682
	Promoted	973	696	12	1233	2914
	%	69.2	97.2	7.8	87.8	79.1
	Female Obs	137	33	8	141	319
	Promoted	100	28	3	120	251
	%	73	84.9	37.5	85.1	78.7

but it provides a way of looking at the experiences of female officers in the armed services. The table can help to show which female officers have a higher promotion rate by commissioning source and service.

In 1988, the average promotion rate for male officers was 62 percent, and for females officers, it was 57 percent. The male officer promotion rate is higher than that of female officers. The promotion rate of male officers in the Navy is quite high (99.2 percent). This is the highest of all services. Female officers in the Navy have a promotion rate of 93.5 percent. The Army female officers' promotion rate (16.2 percent) is higher than that of male officers (12.5 percent). Again the promotion rate of women is limited by the service policy. The Marine Corps has the same promotion limitation as the Army, but the promotion rate of female officers (16.7 percent) is higher than that of male officers (4 percent). In the Air Force, 90.8 percent of male officers are promoted. Female officers have a promotion rate of 84.8 percent.

In 1994, the average promotion rate for male and female officers is quite close: 79.1 percent for male officers and 78.7 percent for their female counterparts. With longer service in the armed forces, the differences in the promotion rates between male and female officers becomes smaller. In the 1988, promotion board results show that, in the

Table 25. Cross-Tabulation for Promotion to Grades 0-4 and 0-5, by DEFENSE PRIMARY OCCUPATION (DPOC) and SERVICE, for 1977 Cohort as of 1988 and 1994

DPOC	YEAR	ARMY	NAVY	MARINE CORPS	AIR FORCE	TOTAL
GENERAL	1988	0	0	0	6	6
	1994	31	0	0	0	31
TACTICAL	1988	118	680	10	1050	1858
	1994	546	425	12	650	1633
INTEL	1988	24	49	0	84	157
	1994	87	35	0	68	190
ENGMAINT	1988	28	117	1	359	505
	1994	99	105	1	187	392
SCIPROF	1988	3	22	0	120	145
	1994	12	16	0	95	123
HEALTH	1988	28	51	0	89	168
	1994	62	36	0	48	146
ADMIN	1988	21	49	0	196	266
	1994	118	29	0	139	286
SUPPLY	1988	23	116	1	175	315
	1994	123	76	2	160	361
NONOCC	1988	0	25	0	0	25
	1994	0	0	0	0	2
TOTAL	1988	245	1109	12	2073	3439
	1994	1078	724	15	1353	3170

Note: the observations in each cell were promoted to O-4 grade in 1988 and O-5 grade in 1994.

Army and Marine Corps, female officers have a higher promotion rate than do male officers. In the Navy and Air Force, the average promotion rate for male officers is higher than that for female officers.

d. Promotion to Grades O-4 and O-5 Grade, by Occupation and SVC

Table 25 presents promotion distribution by occupation and by service. The promotion criteria are different from service to service as well as between occupational groups. In this table, there is an explicit occupation distribution.

In the Army, TACTICAL is the largest occupation in the service, and has more promoted observations. This may be because the TACTICAL occupation has more jobs and more vacancies for officer promotion.

The second largest occupation is ADMIN. It has 160 officers in service. The multivariate regression model showed that ADMIN has a higher promotion likelihood than TACTICAL, but it is not significant. From the table, it can be seen that the Air Force has 196 officers promoted in this occupation, and this was higher than in TACTICAL.

In the Navy, TACTICAL is the largest occupation group, and its promotion rate was higher than that of other occupation groups. The ENGMAINT occupation is the second largest group. This may be because Navy ships require more officers in maintenance. In the Marine Corps, the 1988 promotion board results show only 12 officers were promoted, and 10 of them are from the TACTICAL occupation. This occupation possessed most of the officers. In the Air Force, the TACTICAL occupation shows the same condition, but the other occupations are separated evenly.

ENGMAINT, ADMIN, and SUPPLY also have a large portion of officers in service. From the distribution and promotion observations in Table 25, the TACTICAL occupation is the dominant variable in the DPOC. Therefore, it was selected as a base case in the PROMOTION model.

e. Promotion to Grades O-4 and O-5 by Education and SVC

Table 26 shows the promotion rate relationship between education level and SVC. The model predicted that officers with graduate education have higher promotion rates. This table shows the promotion rates to O-4 in 1988 and the O-5 grade in 1994 for comparison with the model results. From the cross-tabulation of 1988 promotion board results, 72 percent of Air Force officers promoted had a Master's degree. The Navy had a the lower percentage of 35.7 percent, and the Army had 41.6 percent. The average promotion value for officers with a Master's degree for all services is 58.3 percent. In 1994, in the O-5 grade, the average promotion rate of officers with a Master's degree had increased to 80.4 percent.

Table 26. Cross-Tabulation for Promotion to Grades 0-4 and 0-5, by Education Level and SERVICE, for 1977 Cohort as of 1988 and 1994

SVC		ARMY	NAVY	MARINE CORPS	AIR FORCE	TOTAL
1988	All Obs	1903	1121	259	2298	5581
O-4	Promoted	245	1109	12	2073	3439
	MSD	112	396	5	1492	2005
	%	45.7	35.7	41.6	72	58.3
1994	All Obs	1550	749	162	1546	4008
O-5	Promoted	1078	724	15	1353	3170
	MSD	832	470	6	1242	2550
	%	77.5	64.9	40.0	91.8	80.4

Note: 1. MSD is officers with Master or Doctorate Degree.
2. Obs: Observations are all officers in service.

Of promoted Army officers, 77.5 percent had a Master's degree. About 65 percent of promoted Navy officers, and 40 percent Marine Corps promoted officers also had a Master's degree. It may be that they had a low promotion rate in 1994. The Air Force had the highest Master's degree rate of 91.8 percent. The Air Force emphasizes officers' education and provides more education tuition funds for all officers. This may be because the service believes officers require more technical education to perform their jobs. The Army, Navy, and Marine Corps officer promotion rates with Master's degree is less than 50 percent at the level of O-4. The promotion rate is less than the non-Master's degree officers. The regression model (in Chapter IV) shows that POSTGRAD has a negative sign (less likelihood to promote than no Master's degree officers). The answer is that, in the O-5 grade, the rate changes because the average of promoted officers with a Master's degree increased to 80.4 percent. This corresponds to the model. The year 1988 was selected to compare the logistic regression model. No comparison of promotion was made for 1994 or in later years. This can be a topic for further study.

f. Promotion to Grades O-4 and O-5 by Education and SOC

The promotions were not only compared by service but by the commissioning source as well. Table 27 presents an education profile by promotion and commissioning source.

Table 27. Cross-Tabulation for Promotion to Grade 0-4 and 0-5 by SOURCE OF COMMISSION (SOC) and Education, for 1977 Cohort as of 1988 and 1994

SOC	ACADEMY	ROTC		OTHER	TOTAL
1988		Scholarship	Nonscholarship		
All Obs	1266	1457	1730	1128	5581
Promoted	845	1058	847	689	3439
MSD	447	653	571	334	2005
%	52.9	61.7	67.4	48.5	58.3
1994					
All Obs	934	760	1581	733	4008
Promoted	840	626	1186	518	3170
MSD	668	554	941	375	2550
%	79.5	88.5	79.3	72.3	80.4

Note: 1. MSD is officers with Master or Doctorate Degree.
2. Obs: Observations are all officers in service.

From Table 27, in 1988, the highest percentage of promotions with a Master's degree is found among the nonscholarship graduates. Sixty-seven percent of those promoted have a Master's degree. As previously discussed, the ROTC nonscholarship graduates have the lowest promotion rate at the O-4 grade. The Master's degree is an important evaluation factor for the nonscholarship graduates' promotion.

On average, ROTC graduates with a Master's degree have a higher promotion rate than do graduates of the Service Academies and other SOCs. In 1994, the Service Academy promotions for officers with a Master's degree increased from 52.9 percent to 79.5 percent. The ROTC scholarship promotions increased from 61.7 percent to 88.5 percent. The OTHER commissioning source increased from 48.5 percent to 72.3 percent. All SOC officers increased their Master's degree percentage in the O-5 grade promotion board results. This suggests that the Master's degree is becoming a more important indicator of the likelihood for promotion.

D. 1977 COHORT IN SAT SCORE AND FUTURE TREND

To evaluate the quality of officers, five different types of criteria are employed by the military's testing psychologists: (1) college grade point average; (2) training course grades; (3) school or training attrition; (4) military performance rating; and (5) job

performance. [Ref. 7, p.125] For the evaluation in this study, the SAT score is used as a measure to compare officer quality. Table 28 shows the SAT scores of officers in the 1977 Cohort by service. This table may give some evidence to support this study.

Table 28. Scholastic Aptitude Test (SAT) Verbal, and Math Mean Scores of 1977 Cohort Officers, by Service [Ref. 7, p. 195-197]

SVC	ARMY	NAVY	MARINE CORPS	AIR FORCE	ALL SERVICES
Verbal	495	528	476	503	506
Math	534	584	520	565	557
Combined	1029	1112	996	1068	1063

A comparison of SAT scores in the table shows that the Navy has the highest average SAT score in verbal and math, and that the Marine Corps has the lowest average scores of all services. This may be because the Navy has a more selective admission standard for officers, and the Marine Corps has more officers from ROTC, nonscholarship OCS and OTS. Even though the Marine Corps selection criteria are less competitive than in the Navy, there is no significant relationship in promotion and retention rates. From the previous study of the 1977 Cohort, the Navy's officer promotion and retention rates are between that of the Air Force and the Army.

Table 29 compares the SAT scores of students entering the Academy and ROTC in 1987.

The Naval Academy has a slightly higher average SAT score than in any of the other academies or the ROTC programs. The Air Force ROTC has the lowest average SAT score. The combined SAT scores of all Service Academy freshmen are higher than those of the counterparts in ROTC programs. The reason is that the Service Academies only take a small percentage of total applicants, but the ROTC program admits several times this percentage. If the ROTC program had only selected the top applicants for admission, then the SAT scores of ROTC students would be close to, or even higher than, those of students

at the Service Academies. Table 29 only gives a quality reference of the commissioning source. The retention and promotion rates require further study.

Table 29. Academy and ROTC Applicants Scholastic Aptitude Test (SAT) Mean Score of Entering Freshman by Service and Commissioning Program 1987
[Ref. 7, p. 155, 164]

SVC	ARMY		NAVY		AIR FORCE	
	ROTC	ACADEMY	ROTC	ACADEMY	ROTC	ACADEMY
Verbal	490	560	509	583	485	579
Math	545	640	574	664	544	665
Combined	1035	1200	1083	1247	1029	1244
Number	174	14493	48	15565	92	12711

Note: the ROTC program mean scores are the numbers of college admission SAT report.
Table 30 compares the SAT scores of students who entered the Service Academies in 1987 and 1996. This SAT score may help predict the trend of the Service Academies.

Table 30. Comparison of the SAT Scores of Students Entering the Service Academies in 1987 and in 1996
[Ref. 7, p. 155] [Ref. 3, 4, 5]

SVC	SAT score	Class of 1991 Entered in 1987	Class of 2000 Entered in 1996
ARMY	Verbal	560	623
	Math	640	634
NAVY	Verbal	583	633
	Math	664	657
AIR FORCE	Verbal	579	626
	Math	665	649

As seen in Table 30, the SAT verbal scores for the Class of 2000 tend to be higher than those of the Class of 1991 in all services. The opposite is true with respect to SAT Math scores, with higher scores shown for the Class of 1991. This result may only indicate that the SAT score of Service Academies entrants change slightly annually. The two classes have a very close average score in math, but in the verbal score, the 2000 class has a much higher score than does the class of 1991. This may be the case because the Education Testing Service (ETS) changed the grading scale in the intervening years. If the 2000 class

score is converted to the original scale, the average score would be closer. Nevertheless, the data show that the Service Academies still maintain very high quality standards for admission.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The promotion and retention rates of officers commissioned through ROTC tend to vary for the scholarship or nonscholarship programs. The scholarship graduates' promotion rates, retention rates and postgraduate education rates are even higher in some cases than those of the Service Academies. The commitment for U.S. ROTC program is eight years (combined with active and reserve duty, as shown in Table 17). This commitment is long enough for the junior officers and can accommodate short-term officer demands.

1. Commission Source

a. The Service Academies

The Service Academies annually produce about 15 percent of all officers for the U.S. armed forces. Even with military downsizing, each year the average number of students admitted to each of the academies is approximately 1,200. Most of the students have high SAT or ACT scores. Candidates not only compete in academic performance, but also must demonstrate leadership potential, physical aptitude, and medical qualification. With these high standards, the Service Academies still attract enough qualified cadets and form the backbone of the career officer force.

b. The ROTC Programs

ROTC is still seen by many young men and women as an option to achieve career goals. ROTC enhances a student's education by providing unique management training and leadership experience. ROTC training helps the students develop the managerial skills and abilities to handle responsibility and make decisions. All of these leadership qualities can be acquired through ROTC training. ROTC also helps the military by providing the various military services with capable college-educated officers. Each year, about 45 percent of officers are commissioned through the ROTC program. These

new officers enable the military to identify with the opinions and concepts of the civilian society. [Ref. 6, p. 1]

2. Selection for Service Academies and ROTC Programs

Candidate selection at the Service Academies is based on higher standards and is more rigorous than in the ROTC programs. This is because of the historical elite reputation, the perceived influence on career progression, and the limitation on the number of individuals attending Service Academies. The Service Academy candidates have high SAT scores, good personal characteristics, and leadership experience. All of these are required factors and will affect their performance in their future career.

The ROTC has diverse programs for the candidates. Each service has its own recruiting, training, and selection standards. Because a common candidate selection process does not exist, the quality of ROTC students tends to vary by service and by program. This is a distinguishing difference between the Service Academies and ROTC graduates.

3. Retention

The retention behavior from 1977 Cohort data produced several results:

- After first commitment, the ROTC graduates have a 57 percent retention rate. The Air Force ROTC graduates have a 69 percent retention rate. The Air Force apparently desires the more experienced officers to stay, or the officers have a higher satisfaction with the Air Force.

- In 1982, when the Service Academy graduates completed their first term, their retention rate was 72.3 percent. This rate is higher than for ROTC graduates, especially in the case of the Air Force Academy, with a 93.5 percent retention rate because Air Force pilots have longer commitment than 5 years. This confirms that the Air Force has the top retention rate among all commissioning sources and Service Academies.

- Occupation retention rate: TACTICAL is the major service occupation in all armed forces and contributes directly to combat readiness. This occupation has the highest retention rate of all occupations.

- In the 1977 Cohort data, from 1977 to 1994, the retention rate did reveal some differences in the following years: (1) After the first commitment, the retention rate dropped, for both Service Academy and ROTC graduates. (2) After O-4 and

O-5 grade promotion boards, the retention rate dropped more significantly for all commissioning sources. This suggests that the "up or out" policy does affect the retention rate in some ways.

3. Promotion

There is only a small difference in the O-2 and O-3 grade promotion rates among the service and commissioning sources, so the promotion rate to the O-4 and O-5 grade is used for comparison. In addition, the results revealed the following:

- In the O-4 grade, a range from 1986 to 1988 was used to compare the promotion rates. In 1986, the OTHER commissioning sources have a higher promotion rate than do Service Academies and ROTC. In 1987, the OTHER promotion rate was also the highest of all sources. ROTC nonscholarship graduates have the lowest "below the zone" promotion rate of 3.4 percent. In 1988, the Service Academy graduates' promotion rate increased to 66.7 percent, exceeding other sources. The promotion rate of Service Academy graduates is higher than that of the ROTC graduates in the O-4 grade promotion boards.

- In 1994, for the 1977 Cohort officers who were promoted to O-5, the rates were 90 percent for Service Academy graduates, 77.4 percent for ROTC, 70.7 percent for graduates of OTHER programs. This shows that, in the long run, Service Academy graduates have a higher promotion rate than do graduates of other commissioning programs.

- For O-4 and O-5 promotion boards, on average, male officers tend to have a higher promotion rate than do female officers. But in the O-5 promotion board, there is only a 0.4 percentage point difference between genders. But the promotion rate is different for the Army and Marine Corps: The promotion rate among male officers is less than that of female officers in grades O-4 and O-5.

- Promotion rate and education level: Using the Master's degree as an assessment for the promotion rate, 58.3 percent of officers promoted in O-4 grade had a Master's degree and 80.4 percent of the officers promoted in O-5 grade had a Master' degree. This indicates that higher education is an important indicator for promotion. For Air Force officers, 72 percent of O-4 promotion boards, and 91.8 percent of the O-5 promotion board officers had a Master's degree. This result shows that the Air Force emphasize officers' education and values the training benefits. ROTC graduates had higher Master's degree rates in the O-4 and O-5 promotion boards than did the Service Academy graduates. It is possible that

ROTC graduates believe a Master's degree will give them greater opportunities for promotion or for civilian employment upon leaving the military.

4. SAT Score

SAT scores were used to evaluate of officer quality. In the 1977 Cohort, the Navy had the highest SAT scores for math and verbal among the services. But SAT scores do not affect officer promotion and retention rates. Though Navy officers have higher SAT scores at admission, their postgraduate education percentage is less than in other services. This may be a result of the Navy's environment. In 1988, all the SAT scores of Service Academy students were higher than those of students in ROTC programs. This fact limited the use of the SAT score to support the comparison. A quality comparison requires further study. The Service Academies have historically had a good reputation and they are considered to be among the most selective schools of higher education in the nation.

B. RECOMMENDATIONS

From its inception, ROTC's role has been viewed as one of civilian influence over officer development. ROTC is the basis for a strong partnership between academia at both the college and high school level. This partnership provides the armed forces with exposure to a large number of people who otherwise might not have come in contact with the military. Most importantly, the armed forces receive officers who are college graduates and have a broad range of experience and expertise in scientific, economic, and political and social science fields. This understanding supports the following recommendations:

- The U.S. ROTC program provides 45 percent of the commissioned officers to the armed forces. It is the largest commissioning source for all services. The Taiwan military is made up of only 15 percent voluntary officers. The ROTC program of ROC DoD can increase the number of voluntary officers for the military. [Ref. 11]

- The U.S. ROTC program enables the U.S. Armed Forces to meet the demand for newly-commissioned officers. If the Taiwan DoD can successfully implement an ROTC program, the shortage of new officers in Taiwan would soon be solved.

- The U.S. ROTC program only recruits qualified college students. ROTC program participants tend to have higher SAT or ACT scores than the average of all college students nationwide. The Taiwan DoD also recruits college or university students whose quality tends to be higher than that of the average college student.

The thesis analyzes the promotion and retention rates of officers commissioned through ROTC and the Service Academies. The results show that the U.S. ROTC program is an effective vehicle for recruiting, preparing, and commissioning officers for the military. ROTC officers tend to lag behind Academy graduates with respect to certain measures of performance, but the differences appear relatively minor in most cases. The following research questions are offered as areas for further study of the U.S. ROTC program, and a further aid for the Taiwan DoD in developing its own ROTC program.

What is the ROTC organization, including the chain of command in all services and the relationship between the services? What are the recruiting procedures and selection standards in all ROTC programs? How is the budget determined? How is the budget used on campus? How should the budget be efficiently spent? How is the ROTC campus staff selected? What are the screening standards, and is this task implemented on the campus? How are the contract colleges and universities selected? What benefits extend to DoD and the colleges? How can ROTC recruiting be improved? What is the standard recruiting procedure? What is the college background of ROTC students? Do the background characteristics of the students relate to their performance in the military? What are the ROTC program students' geographic backgrounds; and are these geographic factors significant indicators of service performance? What are ROTC program students' SAT scores in recent years? And, finally, is there a relationship between the service occupations of officers commissioned through ROTC and their retention or promotion?

APPENDIX

Table 31. Expected Signs for Variables in Retention Model

VARIABLE	Sign	Exp. Reason (All variables are compared against the base case)
MINORITY	+	Minority officers have a high likelihood of staying after 11 years service.
WHITE		Base case.
MALE		Base case.
FEMALE	–	Female officers are more likely to stay after 11 years of service. They have more experience in the military.
MARRIED	+	Married officers are more likely to stay due to the job stability and medical care and other benefits from the military.
ACADEMY		Base case.
ROTC	–	This sign should be negative. ROTC graduates joining the military are most likely to do so for the college scholarship; after their "payback" commitment, they are more likely to leave.
OTHER	–	This includes OCS, OTS, Direct Appointment and other officers. They do not have strong incentive to serve longer in the military, and this sign is expected negative.
POSTGRAD	–	Officers who obtained a Master's degree while on active duty are typically more "marketable" to the civilian business community, and thus more likely to leave.
CHILDREN	+	Officers who have more children and dependents are more likely to stay because the military can offer them more benefits.
TACTICAL		Base case.
INTEL	–	The sign is expected to be negative, when compared to the tactical community in the services.
TECHNIC	–	The sign is expected to be negative.
HEALTH	–	Officers in health community are more likely to leave because their jobs are easily transferred to a civilian community.
OTHSUP	–	Include administrators and nonocc. The same rationale as HEALTH.
SUPPLY	–	The same rationale as HEALTH.

Table 32. Expected Signs For Variables in Promotion Model

VARIABLE	Sign	Exp. Reason (All variables are compared against the base case)
MINORITY	–	It is expected that minority officers would have a lower likelihood (than the Base Case) to be promoted to 0-4, based on previous research.
WHITE		Base case.
MALE		Base case.
FEMALE	–	Female officers have a lower likelihood (than the Base Case) to be promoted to 0-4, based on previous research.
MARRIED	–	It is assumed that married officers are less likely to be promoted, because they have competing responsibilities.
ACADEMY		Base case.
ROTC	–	ROTC graduates are a large segment of the military, but their motivation may not be as strong as that of Academy graduates.
OTHER	–	This includes OCS, OTS, Direct Appointment, and other program officers. They do not have a strong incentive to serve in the military for a long term. It is expected this sign would be negative.
POSTGRAD	+	If an officer obtained a Master's degree while on active duty, it is assumed that he or she would have a greater likelihood of promotion.
CHILDREN	–	Officers who have more children and dependents are less likely to be promoted because of separate family obligations.
TACTICAL		Base case.
INTEL	–	This sign would be negative, when compared with the tactical community in the services.
ENGMAINT	–	The same rationale as INTEL.
SCIPROF	–	The same rationale as INTEL.
HEALTH	–	Officers in health community are less likely to promote, due to job vacancies. But they receive more bonuses.
ADMIN	+	The ADMIN occupation is more likely to promote, because the community has more vacancies.
SUPPLY	–	The same rationale as HEALTH.

Table 33. Explanatory Variables Value and Definition for Retention and Promotion Model

VARIABLES	Possible Variables:	Description:
WHITE	1=WHITE 0=NOT WHITE	Base case
MINORITY	1=MINORITY 0=NOT MINORITY	Race, include Black and other minorities.
MALE	1=MALE 0= NOT MALE	Base case
FEMALE	1=FEMALE 0=NOT FEMALE	Gender of officers.
MARRIED	1=MARRIED 0=NOT MARRIED OR DIVORCED	Marital Status of officer.
ACADEMY	1=ACADEMY 0=NOT ACADEMY	Base case
ROTC	1=ROTC 0=NOT ROTC	Commissioned from ROTC program.
OTHER	1=OTHER 0=NOT OTHER	Commissioning source other than Academy and ROTC.
POSTGRAD	1=POST GRADUATE 0=NO POST GRADUATE	Determines if officer has graduate education or not.
CHILDREN	1=HAVE CHILDREN 0=NO CHILDREN	Determines if officer has at least one child as dependent.
TACTICAL	1=TACTICAL 0=NOT TACTICAL	Base case
INTEL	1=INTEL 0=NOT INTEL	Intelligence. DoD Primary Occupation Code (DPOC) for all services.
ENGMAINT	1=ENGMAINT 0=NOT ENGMAINT	Engineering Maintenance.
SCIPROF	1=SCIPROF 0=NOT SCIPROF	Scientists and Professionals.
HEALTH	1=HEALTH 0=NOT HEALTH	Health Care.
ADMIN	1=ADMIN 0=NOT ADMIN	Administrators.
SUPPLY	1=SUPPLY 0=NOT SUPPLY	Supply and Procurement and Allied.
NONOCC	1=NONOCC 0=NOT NONOCC	Occupation not defined or no occupation.

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